

Seagate Barracuda
7200.11 1.5TB

AMD ATI
Radeon HD 4830

Cooler Master
ATCS 840

cpl

COMPUTER POWER USER



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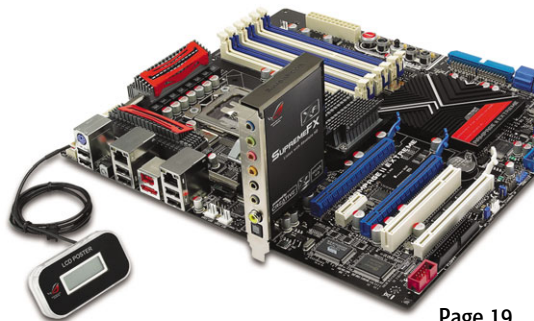
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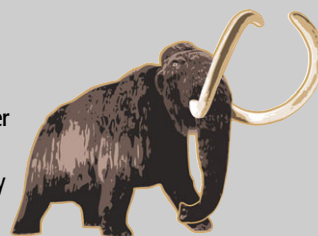
On page 8 of the December issue, we incorrectly called the Seasonic fan inside the company's own M12D PSUs the 21FC. The fan is the S2FC.

In our review of Adobe Acrobat 9 Pro Extended, starting on page 78 of the January issue, we incorrectly stated that Acrobat 9 Standard is free. Acrobat 9 Standard's retail price is \$299.

Infinite Loops

Strange stats and other
oddball items from
computing's periphery

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EDITOR'S NOTE

Regardless of your position on the massive government bailouts Washington was mulling at press time, they raise some pretty interesting questions.

For starters, how does Congress move ahead with massive financial aid for the Big Three in Detroit when polling data shows that more than 60% of Americans are against it? But also, what exactly are the criteria Congress uses for determining whether a company and/or industry should get emergency help in the form of ginormous stacks of cash?

If AMD were to announce today that it was in far worse shape than it had let on and needed immediate help, would the government float it a huge loan of some kind to allow it to stay in business while it sorted things out? Or would the fact that Intel is in relatively decent shape mean that the semiconductor industry as a whole could survive without help? I mean, isn't it important to have competition in a vital industry like that?

What about Microsoft? If the company that makes and supports the operating systems and office software the vast majority of the world's computers were in danger of flickering and dying, would that warrant swift legislative action?

And, of course, this brings us to the most vital question of all: Will Washington bail out Midway? The company reported recently that it needed \$150 million in 50 days in order to survive the maturation of some pretty heavy credit notes. After all, we are talking about the company that created and owns the rights to Mortal Kombat. I admit, I'm not entirely sold on this Mortal Kombat vs. DC Universe thing, either, but are we prepared to live in a post-Mortal Kombat world?

President Obama said early in his President-Electness that he would "throw [his] weight around" to try and get college football to adopt a playoff system, and I'm all for putting a stake in the heart of the BCS. But what is he willing to do for Mortal Kombat? Does he play the game, or is he more of a Street Fighter guy? Does he prefer Unreal Tournament, or Halo?

I think we need to know some of these things a little earlier in the election process, perhaps for all of our elected officials. In the sixties, the rallying cry was "never trust anyone over 30." I say we should never trust anyone who can't do a crouch-jump.



Chris Trumble, Publication Editor, *CPU*



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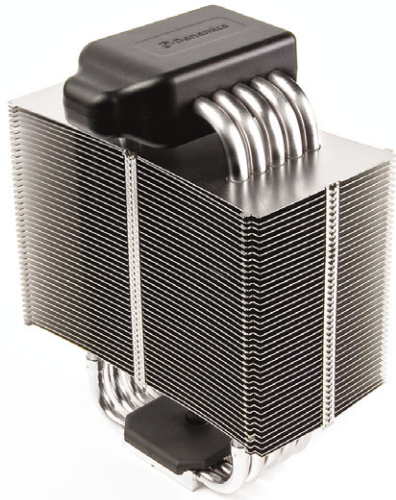
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Gotcha.
Here it is.



Danamics Makes Liquid-Metal Cooling A Reality

Although NordicHardware concluded in its December 2008 world-exclusive review of Danamics' new LM10 that the "world's first commercially available liquid metal-based CPU cooler" is currently "not much else than a pretty good CPU cooler compared to other air-cooled units," the \$350 LM10 is still an intriguing bit of engineering. Using a patent-pending multistring electromagnetic pump and sodium-potassium mixture Danamics calls NaK, the LM10 uses "no moving parts, shafts, seals, etc." and "emits no noise or vibration." The design also provides "unlimited MTBF and suffers no performance-degrading over time." As NordicHardware put it, "we're eagerly awaiting the next cooler from Danamics." ▲

Belkin Helps Users Switch To Mac, Frees FlyWire

We're assuming we have a few Mac converts among us or at least a few considering making the jump. If so, Belkin's new Switch-to-Mac Cable (\$49.99; Belkin Migration Assistant software included) claims to transfer photos, music, settings, preferences, and other files automatically at USB 2.0 speeds. Files move from default folder to default folder (My Music to iTunes, etc.), and a summary details what's been hauled when finished. Elsewhere, Belkin's FlyWire (\$1,499.99) is now shipping to wirelessly connect (six inputs; three HDMI included) Blu-ray players, DVRs, gaming consoles, and other HD/SD devices to your HDTV for up to 1080p viewing. Belkin provides a "range capable of reaching your entire home" over the 5GHz band. ▲



The Dawn Of USB 3.0 Is Upon Us

The SuperSpeed USB spec, or USB 3.0, is official. Unveiled at the SuperSpeed USB Developers Conference in November 2008, USB 3.0 offers up to 5Gbps transfers (10x faster than USB 2.0), backward-compatibility, and better power management. Though products integrating USB 3.0 aren't expected until 2010, discrete controllers are expected this year. Digicams, flash drives, and DAPs are among the first USB 3.0 devices expected. In-Stat senior analyst Brian O'Rourke stated that, based on In-Stat's April 2008 "Wired USB 2008: SuperSpeed is Coming" report, "the expected compounded annual growth rate for USB 3.0 from 2009 to 2012 is over 100%, reaching over 500,000,000 devices in 2012." ▲

Listen Up: New Headphone Choices Are Plentiful

Whether gamer, audiophile, or iPod owner, now is a good time to buy new headphones. Designed specifically for gamers, Able Planet's CEO Kevin Semcken says his company's ultra noise-canceling PS500MM (\$99; www.ableplanet.com) reduces hearing loss and fatigue risks associated with "extended play of rich multimedia sounds" in PC games so "users no longer have to turn up the volume just to be able to drown out background noise." Phiaton, meanwhile, has the new MS 400 (\$249; www.phiaton.com) for "upscale and discerning consumers"; the PS 200 (\$249) sound-isolating earbuds with dual-balanced armature drivers; and the audiophile-gear PS 500 (\$299), with "studio-grade" 40mm titanium drivers. Lastly, Apple's overdue In-Ear Headphones (\$79; www.apple.com) are finally here, complete with integrated remote and mic. ▲



HARDWARE MOLE

1 Billion & Counting For Logitech

How many companies in any industry can claim they've shipped 1 billion of anything (well, besides McDonald's)? Add Logitech to the short list. In December 2008, Logitech, which released its first retail mouse in 1985, shipped "Billie" from its Suzhou, China, plant. You can track Logitech's journey in returning Billie back to CEO Jerry Quindlen as part of a promotion that will give \$1,000 to whoever guesses where Billie ultimately lands at blog.logitech.com/billie. If you're a G9 owner, mean-

while, you can customize it with an image of your choice via Logitech's new G9 grips (\$19.99), which are patterned after the G5. ▲



Nvidia To Enter The Netbook Fray?

With Asus rolling right along with the December 2008 release of its new brushed-metal Eee PC 1002HA (\$499; www.asus.com), MSI recently detailing its upcoming Wind U120, and Intel dominating with the Atom, comes news that Nvidia is considering entering the mininotebook space, although it's reportedly waiting to see how the market shapes up first. "We're not saying we're not interested; it's a matter of how the market will evolve," Nvidia CFO Marv Burkett stated. If Nvidia does get in the game and bulks netbook graphics up enough for even decent gameplay, look out. ▲

LOST MOUSE



REWARD

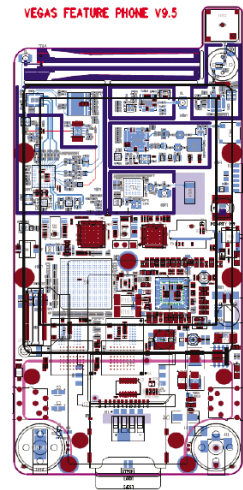
FOR THE SAFE RETURN OF
LOGITECH'S ONE BILLIONTH MOUSE
TO ITS OWNER,
JERRY QUINDLEN, CEO OF LOGITECH

Department Of Defense Bans Flash Drives

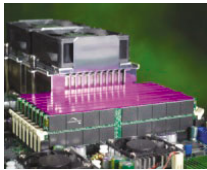
Toting a flash drive into the Pentagon is now a no-no, due to the threat of whacking DoD networks with a virus. Though nothing official had been released at press time, various reports stated an internal DoD message recently banned employees from using thumb drives and other removable storage devices. A bold-faced message in red type on the Naval Reserve Command Web site, in fact, read "all RESFOR personnel are directed to IMMEDIATELY suspend the use of all thumb drives on all Navy Networks" until notified further. Elsewhere, the *LA Times* reported that senior military leaders briefed President Bush in November 2008 on a severe widespread attack on DoD computers, possibly originating in Russia. ▲

Sandbridge Technologies Shows Off Software-Defined Radio Chip

Chip companies have been pursuing the Holy Grail of software-defined radio for a long time. That refers to a chip that can change its circuitry on the fly so that it can receive a number of different types of radio signals. A cell phone with an SDR chip could switch from radio to radio, allowing someone to get reception in a variety of countries by switching from CDMA to GSM, for example. Sandbridge Technologies of Tarrytown, N.J., said its second-generation chip, the SB3500, can do just that. It can process signals for eight types of signal, including Long Term Evolution and WiMAX next-generation 4G signals. In doing so, it can replace several chips in a cell phone, cut costs, and lower power consumption. Sandbridge says it will deliver the chips this year. ▲



Spanion & Virident Reveal EcoRAM



Spanion and Virident Systems have teamed up to deliver EcoRAM, a new kind of server memory chip that is more dense and energy efficient than existing DRAM (dynamic random access memory). By replacing DRAM chips with NOR flash memory, the two companies are able to read data at the same speed. But they can cram 512GB of storage in the same size module as 32GB of DRAM, and the cost and power savings are far better. NOR flash uses about a tenth of the power of DRAM, and it doesn't lose data when the power is turned off as DRAM does. The power efficiency is important at a time when each data center consumes the energy of about 25,000 homes. The EcoRAM chips are ideal for servers that retrieve search results, analyze genetic data, or sift through seismic data in real time. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Phenom X3 Triple-Core 8750 2.4GHz	3/27/2008	\$195**	\$139	\$154
AMD Phenom X3 Triple-Core 8650 2.3GHz	3/27/2008	\$165**	\$114	\$119
AMD Phenom X3 Triple-Core 8450 2.1GHz	3/27/2008	\$145**	\$104	\$106
AMD Phenom 9500	11/19/2007	\$251**	\$174	\$163
AMD Phenom 9550	3/27/2008	\$195**	\$151	\$144
AMD Phenom 9600	11/19/2007	\$283**	\$119	\$119
AMD Phenom 9600 Black Edition	12/23/2007	\$251**	\$179	\$179
AMD Phenom 9750	3/27/2008	\$215**	\$168	\$164
AMD Phenom 9850 Black Edition	3/27/2008	\$235**	\$182	\$182
AMD Phenom 9950 Black Edition	7/3/2008	\$235**	\$184	\$196
Intel Core 2 Duo E8200 45nm	1/7/2008	\$163**	\$159	\$181
Intel Core 2 Duo E8400 45nm	1/7/2008	\$183**	\$165	\$164
Intel Core 2 Duo E8500 45nm	1/7/2008	\$266**	\$204	\$185
Intel Core 2 Duo E8600 45nm	8/10/2008	\$266**	\$279	\$269
Intel Core 2 Quad Q6600	1/8/2007	\$851**	\$195	\$189
Intel Core 2 Quad Q6700	7/16/2007	\$530**	\$296	\$296
Intel Core 2 Quad Q9300 45nm	1/7/2008	\$266**	\$244	\$259
Intel Core 2 Quad Q9400 45nm	8/10/2008	\$266**	\$269	\$269
Intel Core 2 Quad Q9450 45nm	1/7/2008	\$316**	\$349	\$362
Intel Core 2 Quad Q9550 45nm	1/7/2008	\$530**	\$313	\$346
Intel Core 2 Quad Q9650 45nm	8/10/2008	\$530**	\$576	\$560
Intel Core 2 Extreme QX6800	7/16/2007	\$999**	\$1,191	\$1,005
Intel Core 2 Extreme QX6850 3GHz 8MB cache 1,333MHz FSB 65nm	7/16/2007	\$999**	\$649	\$699
Intel Core 2 Extreme Quad QX9650 3GHz 12MB cache 1,333MHz FSB 45nm	11/12/2007	\$999**	\$1,081	\$1,040
Intel Core 2 Extreme Quad QX9770 3.2GHz 12MB cache 1,600MHz FSB 45nm	2/19/2008	\$1,399**	\$1,429	\$1,404
Intel Core 2 Extreme Quad QX9775 3.2GHz 12MB cache 1,600MHz FSB 45nm	2/19/2008	\$1,499**	\$1,651	\$1,637
Intel i7-920 (8MB L3 cache 2.66GHz 4.8GTps)	11/17/2008	\$284**	\$284**	n/a
Intel i7-940 (8MB L3 cache 2.93GHz 4.8GTps)	11/17/2008	\$562**	\$562**	n/a
Intel i7-965 (8MB L3 cache 3.2GHz 6.4GTps)	11/17/2008	\$999**	\$999**	n/a



Everspin Shows Off New Generation Of Magnetic RAM

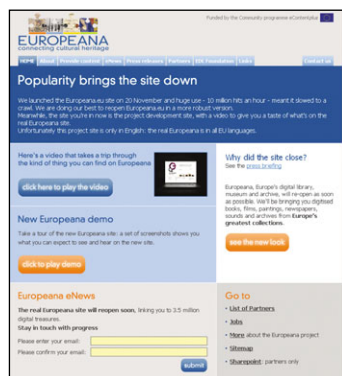
Magnetic-based memory chips, or MRAM, can combine the best of flash memory and DRAM. Like flash, MRAM can store data permanently. But like DRAM, it can be blazing fast. Everspin, a spin-off from chip maker Freescale Semiconductor, has launched a new generation of MRAM chips. They store data by changing the directional facing of a magnet. Everspin has now released a greater variety of chips, including a 1Mb chip with eight channels of bandwidth and a 4Mb chip with eight channels. Those chips don't hold enough data to threaten DRAM just yet. But they are already being used in a variety of storage devices, industrial control systems, transportation devices, communications gear, and gaming machines. They will also come packaged in ball grid arrays, which means they could be used in compact battery-powered consumer electronic devices. ▲

Are American Youth Internet-Deprived?

Finally, some proof to the rest of the world that we Americans aren't a privileged, spoiled lot. According to recent survey results from the Center for the Digital Future at USC's Annenberg School for Communication, conducted as part of a 372-page 2009 World Internet Report, only 88% of American youth ages 12 to 14 have Internet access. That compares to 100% of British youth with Internet access, 98% in Israel, 96% in the Czech Republic and Macao, and 95% in Canada. Researchers in 13 countries reportedly conversed with 25,000-plus people in 2007 and 2008 for the report, which also indicated Internet use among U.S. citizens over 18 trails citizens in Sweden, New Zealand, and Canada. ▲

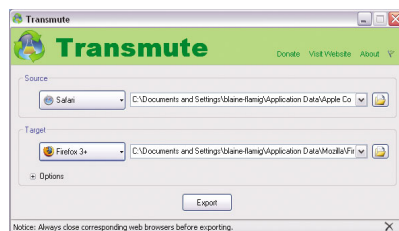
European Digital Library Debuts, Then Crashes

The European Union's much-anticipated and evidently incredibly popular Europeana (www.europeana.eu) digital library containing 2 million-plus multilingual digital books, maps, paintings, photos, films, audio, and more should be back online in "a more robust version" as you read this. Almost immediately after launching on Nov. 20, 2008, Europeana took a nosedive when its servers reportedly took on 10 million hits an hour. The site was reportedly prepared for 5 million hits per hour, but a simultaneous desire among users to view da Vinci's Mona Lisa is said to have contributed to the crash. Europeana ultimately plans to have 10 million artifacts online by 2010. ▲



Transmute Does The Browser Switcheroo

If you're a connoisseur of Web browsers, give the simple but slick Transmute (free; www.gettransmute.com) a test drive. Hailed as a bookmark conversion app, the Windows-only but "amazing utility will help you to try out different Web browsers, synchronize bookmarks between systems, organize bookmarks, convert bookmarks for use in bookmark managers, share bookmarks with others, and more." Support is included for Chrome, Firefox, IE, Opera, Safari, Seamonkey, Flock, and the open-source Chromium. A portable download version is also available. You'll need .NET 2.0 framework, but Transmute includes a backup file creation and timestamp options. ▲



SIGHT SEEING



Mozilla Plays Dress-Up With Firefox

Perhaps you were one of many who helped Firefox gain a 20% browser market share for an entire month in November 2008, marking a first for Mozilla since Web metrics company Net Applications started charting such data. If so, you'll appreciate Mozilla's recent Fashion Your Firefox offering. Rather than poke and prod through an overflowing closet of extensions available for Firefox, Mozilla has conveniently picked a few extensions to match nine user-personality categories. Thus, if you're a digi-cam buff, check out the Shutterbug category (Fotofox, Cooliris, etc.). Other wardrobe choices include News Junkie, Executive Assistant, Rock Star, Decorator, Social Butterfly, Finder and Seeker, Shopaholic, and Digital Pack Rat. ▲

TV's History From Those Who Made It

As the Archive of American Television (www.emmytvlegends.blogspot.com) puts it, "There are stories behind what we see on the screen—crucial eyewitness accounts of world-changing events, pop culture origins, technological innovations, and artistic insights." To document said stories, the Archive has conducted over 2,000 hours of interviews with hundreds of actors, producers, writers, newscasters, executives, directors, and other movers and shakers, capturing their "vivid oral histories." Scores of interviews are available via YouTube, including ones with Walter Cronkite, James L. Brooks, George Carlin, James Garner, Andy Griffith, Ron Howard, Marty and Sid Krofft, and the Fonz himself. Unfortunately, viewing interviews not yet online requires an appointment with the Archive. ▲

GigaTribe Gives U.S. File-Sharers P2P Communities

We're of the notion that what you do behind closed doors is your own business. Apparently, French-based GigaTribe, which boasts a 900,000-user base, agrees. In mid-November 2008, the company released a U.S. version of its private P2P Web 2.0 file-sharing software in free and Ultimate (\$29.95 annually) versions. The software allows for sharing photos, videos, music, and other files with friends, family, co-workers, and anyone else you choose with private 256-bit Blowfish-encrypted settings with no upload or size limitations. The Ultimate version adds faster and unlimited simultaneous transfers, password protection for shared folders, remote access, and more. GigaTribe claims it is 100% spyware-, adware-, and virus-free. ▲

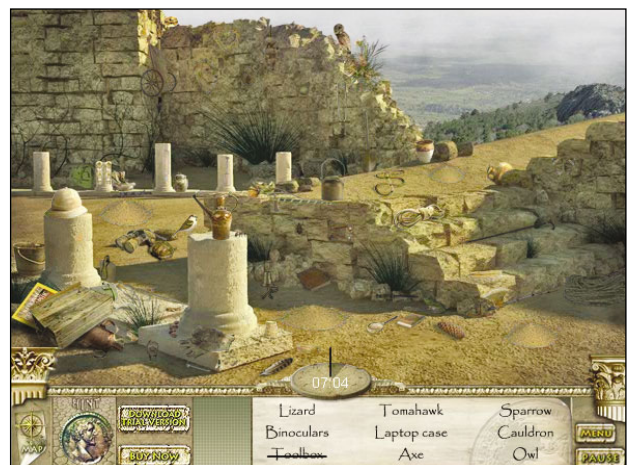


AMD Streams New Catalyst Driver

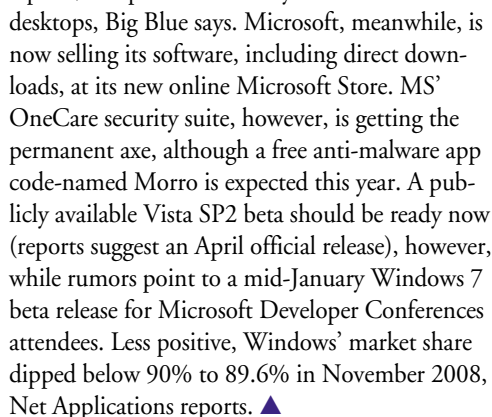
Set for a Dec. 10ish, 2008, release, AMD's new ATI Catalyst 8.12 driver should now be ready to automatically unlock ATI Stream-acceleration abilities in your ATI Radeon HD 4000-series card. Already released for beta testing, 8.12 lets a GPU work with the CPU to accelerate Stream-enabled apps. A free ATI Avivo Video Converter that makes HD video conversion up to 17 times faster than via CPU-alone conversion should also be ready. In tests using an ATI Radeon HD 4850, AMD stated it converted 60 minutes of HD MPEG-2 (1,920 x 1,080; 24fps) video to an MPEG-4 file (320 x 240; 24fps) in about 12 minutes. Look for stream-enabled apps, including ones from ArcSoft and CyberLink, to follow. ▲

National Geographic Puts On Its Game Developer Hat

National Geographic may never match the reported 2.8 million copies of World of Warcraft: Wrath of the Lich King that Blizzard Entertainment sold in 24 hours after its November 2008 release, but the venerable pub's dip of the toe into the gaming realm is noteworthy none-the-less. With the newly formed National Geographic Games, the company will develop in-house titles and work with outside developers/publishers on titles for the Nintendo Wii and DS, PlayStation 3, PCs, iPhone, and other devices. NGG has already partnered with Namco Bandai and Sony Computer Entertainment and released Herod's Lost Tomb, a hidden-object adventure (free trial or \$6.99). ▲



“Microsoft-free” corporate computing. That’s the aim of IBM’s new virtual desktop bundle consisting of Virtual Bridges’ Verde virtual desktop client, Canonical’s Ubuntu Linux, and IBM productivity apps. The package (\$59 to \$289 per user) could save up to \$800 per user annually vs. Windows-based



Now available to add some pizzazz to your analog/digital music and photos are several new releases, including Honest Technology's Audio Recorder 2.0 Deluxe (\$79.99; www.honesttech.com), a USB hardware-software brick that converts cassette tapes and LPs to WAV files, MP3s, and audio CDs. Named a 2009 CES design and engineering honoree, Audio Recorder includes noise reduction, digital amplification, auto trace splitting, and audio-editing ability. Songbird 1.0 from Pioneers of the Inevitable, meanwhile, is an open-source Mac/Windows/Linux audio player that admittedly has "still a lot to do" but already packs a music browser; Last.fm and ShoutCast integration; customization options; and artist-related Flickr, YouTube, Last.fm, and Google content. Elsewhere, Photowriter (free) and Image Smith batch conversion software (free trial or \$15.95) are funky photo apps that, respectively, write text in cool fonts directly on photos and perform basic and advanced batch edits quickly and easily. ▲



After six months of beta tests, NovaShield made its Anti-Malware 2.5 official to home consumers and small businesses. NovaShield's first commercial release, Anti-Malware 2.5 is a "second-generation behavior-based" app that uses a "radically new approach designed to detect, block, and remove" malware. With research from the University of Wisconsin's computer science and security lab and funding from the NSF in tow, Anti-Malware veers from using signatures to identify/quarantine malware in favor of "specification-based monitoring" that relies on about 12 generalized policies for real-time identification of malicious activity. Designed as a supplement to signature-scanning AV apps, Anti-Malware comes in a 15-day trial and one-year license (\$19.95). ▲

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpubmag.com/cpubfeb09/bios to see our entire upgrade list.

CPU / February 2009 **11**

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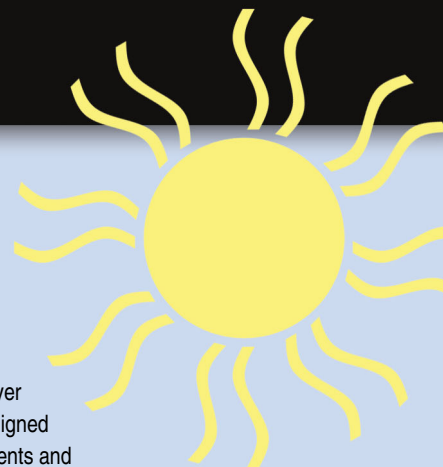
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Job Of The Month

Renewable energy is the next great challenge and opportunity for tech workers, and the newly created eSolar is one of the most ambitious startups in the field. The Los Angeles company is building utility-grade solar power plants to deliver electricity on a large scale. Among the most senior openings is Thermal Engineer, the person who supports R&D in developing solar thermochemical reactors. You will be conceptualizing, testing, and building these next-gen power plants. Naturally, you need an intimate knowledge of heat transfer, thermodynamics, and fluid mechanics. You will be working with heat flux sensors, pyrometers, and flow and stream control.

If you prefer to work the mechanical side of things, eSolar also needs a Product Design and Development Engineer to work on the solar collection system. This key player ensures that the panels themselves are designed to work and move in the harshest environments and deliver the raw energy many hope will power part of the next century.

www.esolar.com/about/careers.html



By The Numbers

39%

Percent of PC owners whose machines did not work properly in last 12 months

(Pew)

www.pewinternet.org/pdfs/PIP_Tech_Failure.pdf

15%

Percent of iPod or MP3 owners whose devices did not work properly in last 12 months

(Pew)

www.pewinternet.org/pdfs/PIP_Tech_Failure.pdf

5.6%

First year malfunction rate for iPhones

(SquareTrade)

www.squaretrade.com/htm/pdf/SquareTrade_iPhone_Study_1108.pdf

11.24%

Failure rate for printer driver installations under Windows Vista

(Microsoft)

<http://tinyurl.com/6frwbc>



Nintendo's Game To Lose

Nearly two years into the current generation of game consoles, Nintendo maintains a commanding lead in monthly hardware sales, according to October 2008 figures.

Console Oct. 2008 Sales

Console	Oct. 2008 Sales
Wii	803,000
Nintendo DS	491,000
Xbox 360	371,000
PSP	193,000
Playstation 3	190,000



Source: NPD

www.twice.com/article/CA6618374.html?industryid=23106

Top 10 Online Transactions Categories

According to Nielsen Online, 78% of all U.S. online adults made a purchase on the Web over the past six months.

Category	Composition Percent	Reach (in 000s)
Online Travel Purchase	38	54,417
Credit Cards—Manage Account	36	51,731
Home Banking Transaction	35	49,899
Clothes/Shoes/Accessories	28	40,075
Books	26	37,001
Hotel/Motel Reservations	18	26,055
Auctions	16	23,449
Event Tickets	14	20,820
Insurance	11	16,385
Computer Software	11	15,580

Source: Nielsen Online, Winter 2008/2009
www.nielsen-online.com/pr/pr_081112.pdf

The Saint

by Alex St. John

Big Ideas

When I worked for Microsoft, I licensed the CAB compression format for Windows 95 so that it would fit on 25 floppies when it launched. CAB compression was so efficient in its time that it went on to become the standard compression format for Internet Explorer and MS Java. Compression technology has always gone hand in hand with media delivery. Even with all the processing power, bandwidth, and memory available today, delivering simple music or video without compression would overwhelm our Internet connections and our video bandwidth.

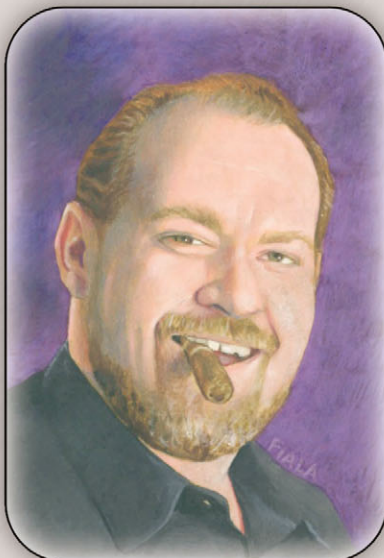
The big idea I want to try to convey is that processing power is just information storage in the time domain. In other words, computing power as we measure it is just a measure of how much data we can compress into a small unit of time instead of into a small unit of space. Consider the ratio π , for example: To store the first 1,024 digits of π in memory in ASCII format, I would need 1KB of RAM. I could, however, achieve 1,024x compression by simply storing the symbol for π in one byte of RAM and telling the processor to compute as many digits as I need on demand. If we suppose that it takes 1/1,000th of a second for my CPU to compute 1,024 digits of π , I could equate my processor's performance or computing power to being worth 1K of RAM per second for the purpose of storing π .

For the purpose of this discussion, I'm going to coin a new unit of processing power called the "ramsecond," which is the amount of a particular type of data I can store in time by computing it instead of keeping it in physical memory. I got the idea for the ramsecond while studying relativity, which has a similarly abstract idea for space-time. Einstein's theory relies on the observation that space and time are a continuous four-dimensional volume, a concept I always struggled to grasp until I read an article that explained the concept thusly: We are always traveling through space-time at the speed of light. When we accelerate our movement in one of the dimensions of space, we must proportionally slow our

movement through time for our velocity through space-time to remain constant; hence traveling at the speed of light requires that we stop moving through time. Time seems like an abstract concept compared to space, but from Einstein's point of view, it's just another "direction." In the same sense, processing power seems like something completely different from data storage, but for the purpose of processing media, it's just another kind of RAM.

Why is the ramsecond a useful concept? Well, for us gamers, it helps us understand that real-time 3D graphics are just another compression format for interactive video. Consider a video game that allowed no interactivity at all to drive the story—we'd call that a movie. It would have much better realism, special effects, physics, and sound if we just stored it as video. If it were a two-hour video stored in the MPEG format, it might be roughly 4GB in size. Now let's add a smidgen of interactivity and allow the user to make a single choice at the beginning of the movie by starting his quest in Paris or New York. That simple choice would double the size of the movie I'd have to make from 4GB to 8GB.

Now imagine a modern video game in which the user makes 30 "choices" per second with a game pad. Suddenly the explosion of permutations requires an interactive movie roughly 4GB times 216,000 in size to store a fully interactive game. Modern games are a mere 10GB in size because 3D accelerators effectively store all the other data games need in highly compressed ramsecond space. That may sound like a crazy compression ratio, but remember that there is infinite data storage available in ramsecond memory. I can keep all the digits of π in it as long as I have an infinite amount of processing time in which to recover them. Thus when we say that we want more "realistic" games, we're also asking for higher-density ramsecond storage for our game data so that we experience fewer compression artifacts while playing them. ▲

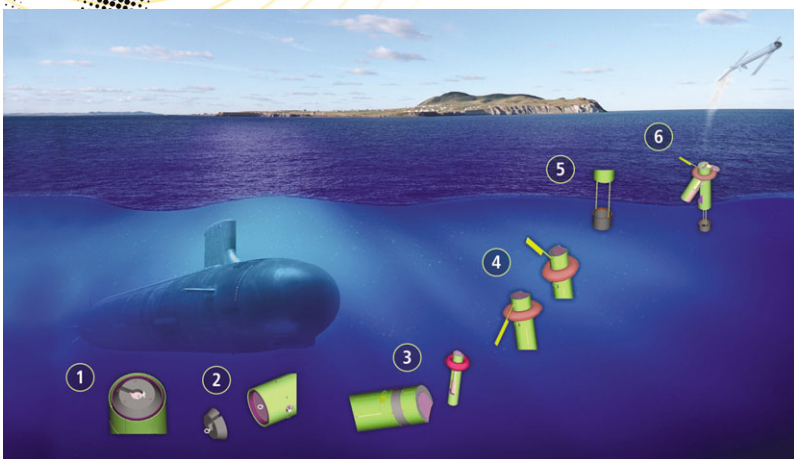


Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM-quality entertainment content over the Web.

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DREAM HARDWARE

These Gizmos Don't Sing It, They Bring It



Some force the secrets out of materials. Others marshal secret, new materiel for our martial forces.

by Marty Sems

Raytheon SOTHOC

If you've read any Tom Clancy, you know that American submarines have some rather awe-inspiring capabilities. You also know that when it behooves a skipper to keep his can silent and sneaky, he can't use his more overt sensory apparatus. Enter (or exeunt) the Raytheon SOTHOC, or Submarine Over the Horizon Organic Capabilities (www.raytheon.com). A sub can drop a module that can subsequently float to the surface and launch a UAV (unmanned air vehicle). The folding-wing, electric aircraft can then operate like a miniature Predator, unobtrusively feeding the sub aerial intel from a much better vantage point. The UAV is meant to be disposable, but it could be retrieved, in theory. Trials thus far have involved successful dummy launches using surface ships, but Raytheon hopes to test the system as intended this year.

FEI Titan 80-3003

So you're way beyond high-def with your 30-inch billboard you call a monitor. But does it have sub-angstrom resolution? Thought not. If you really want to burrow down and see things at the atomic level—no joke—check out the new toy at the Canadian Centre for Electron Microscopy at McMaster University. The \$15 million Titan 80-3003 (www.fei.com) is an s/TEM (scanning/transmission electron microscope) so powerful it comes in an enclosure to completely isolate it from vibration, temperature changes, noise, and even the operator's breathing. With a Titan's-eye-view of the way atoms behave and form materials, researchers can craft better nanostructures, among other things. Down at the entry level, FEI sells the tabletop, touchscreen-operated Phenom (no, not *that* Phenom), which offers roughly 20nm resolution (20,000X magnification) for \$79,000.

Northrop Grumman Vesta II

Evidence of some real genius on Northrop Grumman's part is the Vesta II, which it just delivered to the Air Force for testing as part of the latter's Joint High Power Solid State Laser (JHPSSL) program. This compact laser can pump out 15kW of energy from solid-state, not chemical, components. It's not quite up to the 100kW performance target set by the military, but it should be just the thing for popping large amounts of popcorn from high altitude. Our armed forces would love to be able to zap enemy missiles and artillery rounds in midflight, by the way, not to mention the odd enemy combatant of elevated importance with minimal collateral damage. In fact, they consider it a moral imperative. ▲



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X58 Explosion

A Quartet Of Motherboards, Clocked & Compared

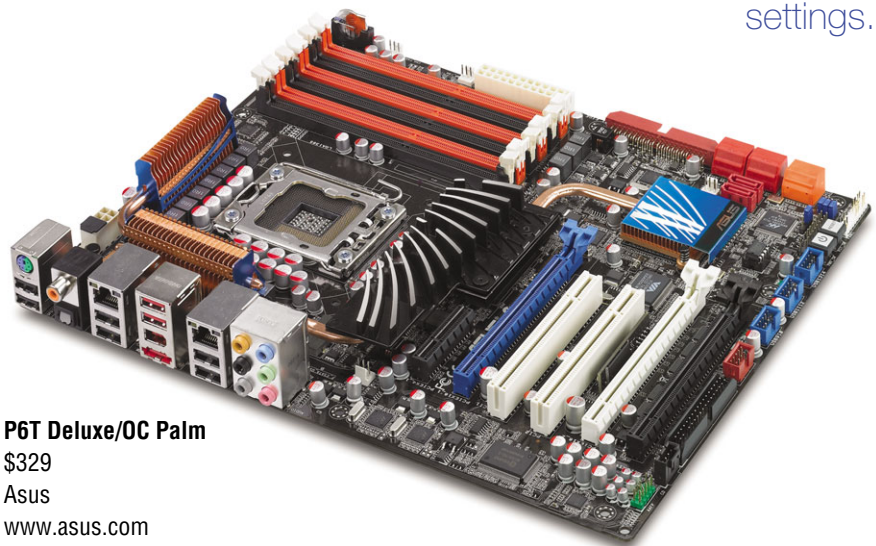
The Nehalem architecture, now dubbed Core i7, introduces a lot of functionality that we've never seen from an Intel processor. Its integrated memory controller, a monolithic quad-core die, and QPI (QuickPath Interconnect, which renders the venerable FSB obsolete) are all massive departures from Core 2 Duo and Core 2 Quad.

But there's a side effect to moving so much circuitry into the processor die. The northbridge, which was truly a hub between the CPU, memory, PCI-E interface, and I/O-laden southbridge, turns into a more basic PCI-E switch. So, at first glance, Intel's X58—the first (and currently only) platform to support Core i7—seems like it could be a real snoozer.

But don't be so quick to judge, dear power users. There's actually a lot more to like about X58 than its predecessor, X48, and much of it has to do with graphics. For the first time (let's not count the uber-expensive Skulltrail configuration here), you can buy an Intel chipset-based motherboard and get support for AMD's CrossFire and Nvidia's SLI. No matter who's winning the graphics war, you're able to drop in the latest cards and enjoy top-notch performance.

Don't forget overclocking, either. Core i7 introduces some interesting concepts to the world of tweaking. For instance, there's a Turbo mode built in to all X58-based boards that turns up clock speed when the chip isn't utilizing all of its processing cores and under-defined thermal thresholds, yielding better performance in applications that are only optimized for one or two threads. You'll see that the first round of X58 motherboards handles this feature in different ways, some more

As expected, the board's BIOS is riddled with enthusiast-oriented settings.



P6T Deluxe/OC Palm

\$329

Asus

www.asus.com



Specs: Intel X58/ICH10-R; triple-channel DDR3-1600 (overclocked); Slots: 3 PCI-E x16, 1 PCI-E x4, 2 PCI; CrossFireX/SLI support; Ports: 6 3Gbps SATA, 2 SAS, 1 eSATA; 2 Gigabit Ethernet; OC Palm USB tool; three-year warranty

suited to enthusiasts than others. The same goes for multiplier-based tuning and adjustments to the BCLK (base clock), which is the 133MHz clock responsible for determining processor, memory, and QPI speeds.

Besides a common chipset, the one attribute you can expect all X58-based motherboards to share is a lofty price tag. And don't forget to add the cost of triple-channel DDR3 memory and a CPU that'll run close to \$300 for an entry-level model. Understandably, you'll want to pick the right pieces for your first Core i7 build, because this is undoubtedly going to be a premium configuration.

Asus P6T Deluxe/OC Palm

The first motherboard in our four-way roundup is Asus' P6T Deluxe, a decidedly workstation-oriented platform with several nods to overclocking enthusiasts, as well.

How exactly does Asus target the professional with its P6T Deluxe? In addition to exposing the X58 chipset's full complement of six 3Gbps SATA connections, it also adds a Marvell 88SE6320 SAS controller with two 3Gbps ports and RAID 0/1 support. Attach a couple of enterprise-class SAS drives spinning at 15,000rpm and you have the makings of a killer video-editing rig.

And what's in store for the overclocker? As expected, the board's BIOS is riddled with enthusiast-oriented settings, which let you manually adjust the performance attributes of a Core i7 CPU and accompanying DDR3. But even flashier is the bundled OC Palm controller, which attaches via USB and offers real-time control over the P6T Deluxe's frequencies, multipliers, and voltages. Asus suggests that these are settings you might want to tune between composing a college paper and playing *Far Cry 2*, for instance, without leaving Windows. We'd be more inclined to think not. Call it being conservative, but a new system—especially a pricey Core i7-based box—should be just as stable sitting on the Windows Desktop as it is slicing through the latest *DirectX 10* title.

In addition to the almost-sanctioned nod toward overclocking and workstation-class storage controller, Asus arms its P6T Deluxe with a couple of other extras that make it sexier than the Intel DX58SO that launched alongside Core i7. First, there's the memory support. Intel somewhat counterintuitively equipped its own board with four 240-pin DDR3 memory slots, warning power users that populating all four would negatively impact performance vs. leaving one empty. Asus more astutely deploys six slots on the P6T Deluxe, claiming support for up to 12GB running at speeds as high as 1,600MHz in triple-channel mode. It's worth noting that many competing boards claim support for 24GB.

Asus is also more aggressive with its array of expansion slots. The DX58SO includes two PCI-E x16 slots, each armed with a full 16 lanes of PCI-E 2.0 connectivity. The P6T Deluxe, however, wields three x16 slots. Of course, Intel's X58 chipset only offers 32 total lanes, so populating the trio does divide the bottom two slots into x8 electrical connections. No worries, though. We've yet to see benchmark results suggesting a PCI-E 2.0 link running x8 signaling rates is bottlenecked.

Where the P6T Deluxe missteps is slot spacing. By having two legacy PCI slots between the top and middle x16 interfaces, the third slot is smashed down at

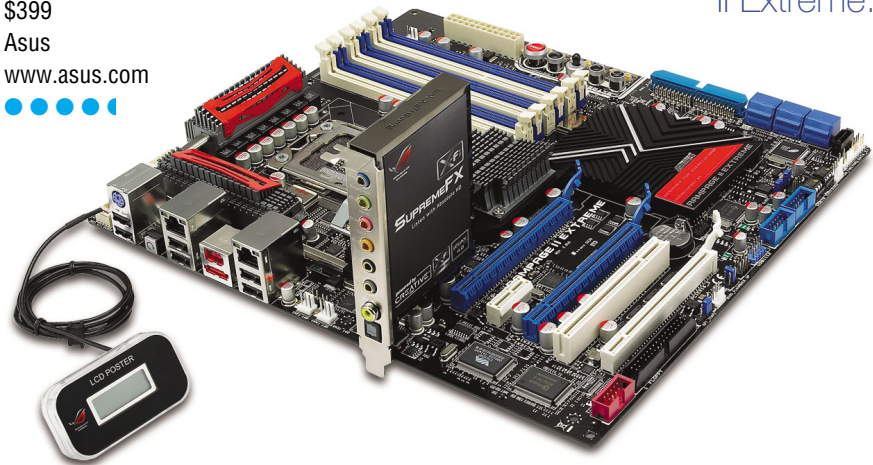
If there's one board that hardcore overclockers will gravitate toward, it's Asus' Rampage II Extreme.

Rampage II Extreme

\$399

Asus

www.asus.com



Specs: Intel X58/ICH10-R; triple-channel DDR3-1800 (overclocked); Slots: 3 PCI-E x16, 2 PCI-E x1, 1 PCI; CrossFireX/SLI support; Ports: 7 3Gbps SATA, 1 eSATA; 2 Gigabit Ethernet; TweakIt/ProbeIt; three-year warranty

the bottom of the board. You can drop in three single-slot cards, but there's not enough room for 3-Way SLI. Thankfully, vanilla SLI and CrossFireX with a pair of Radeon HD 4870 X2 boards still work.

The P6T Deluxe's rear I/O panel reflects the degree of integration Asus dedicated to this board. You'll find one PS/2 port able to take a mouse or keyboard, eight of the platform's 14 supported USB 2.0 ports, optical and coaxial audio output, six 1/8-inch analog audio jacks, two RJ-45 Gigabit Ethernet ports, one FireWire jack, and an eSATA connector.

Asus' first X58 board strikes us as merely average. But the company has a second model much more tuned to the enthusiast's liking.

Asus Rampage II Extreme

If there's one board that hardcore overclockers will gravitate toward, it's Asus' Rampage II Extreme. Two specific features differentiate the Rampage from the pack: TweakIt and ProbeIt. TweakIt enables functionality similar to the OC Palm tool bundled with Asus' P6T

Deluxe, only it's integrated onto the board itself and viewable through a detachable LED. ProbeIt, a marketing name for eight easily-accessible measurement points used to test voltage, is the more exciting of the two. Hang out with enough performance-driven power users, and features like ProbeIt become critical to optimizing overclocks, especially when they start breaking out the liquid nitrogen and custom copper pots.

But you don't have to be an extreme tweaker to appreciate the Rampage's enthusiast appeal, apparent in the layout of its expansion slots, meaty voltage regulation, and copious passive cooling. On this board, Asus sets the three PCI-E x16 slots two slots apart, making room for 3-Way SLI. There's only one space under the third slot, though. If you do use a trio of double-wide graphics cards, you'll also want a case such as Lian Li's PC-P80, which offers extra room at the bottom to accommodate a third GeForce GTX 280 or Radeon HD 4870 hanging off of it.

Asus makes the Rampage II Extreme's BIOS easy to navigate and tweak. All of

the settings needed for significant over-clocks are organized onto the Extreme Tweaker screen (assuming, of course, that you do your tuning from the BIOS). The bundled TurboV software controls frequencies, voltages, and multipliers from a Windows environment. Officially, Asus recommends configuring overclocked settings in the BIOS first, then fine-tuning using TurboV. Call us old-school purists, but we'd rather set our tweaks in the BIOS, where they're not dependent on an operating system. For competitive guys running this board 30 minutes at a time in the quest for benchmarking records, however, quick Windows-based BCLK adjustments are ideal.

Anticipating an overclocking community eager to take advantage of the Rampage II Extreme's flexible software foundation, Asus adorned its first X58-based Republic of Gamers platform with components able to take a beating. The 16-phase circuitry delivers stable power to any Core i7 processor, and three-phase QPI/DRAM power, three-phase northbridge power,

and three-phase memory power are all more intricate than any design we've seen thus far. Initial overclocking results are promising: Our little 2.66GHz Core i7 920 scaled close to a stable 3.9GHz, but it's certainly ready to take custom copper pots and LN2 if you want to find the limits of this board. Passive cooling tops the power circuitry, northbridge, and southbridge; all of them are connected via heatpipe. There's even a blank field on the southbridge heatsink that says "Overclocked By," (seriously) in case you hit a particularly boast-worthy clock speed and want to autograph your own board.

Because most of the architectural details affecting Core i7's performance are now built into the processor, we didn't expect there to be any performance variance among X58-based motherboards. However, there is a benefit to buying Asus' offering over the Intel board, it seems. The Rampage II pulled top billing in our memory bandwidth tests, laid down the fastest Far Cry 2 frame rates,

and churned through our Xvid encoding batch ahead of the others.

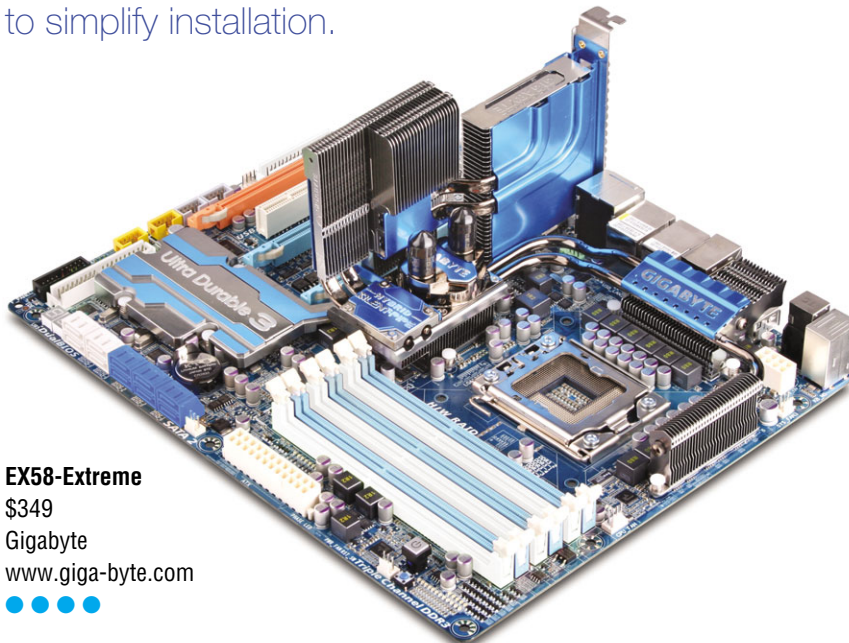
Don't buy Asus' Rampage II Extreme because you want an extra frame per second at stock speeds, though. Buy it because you fully intend to take a Core i7 processor and tweak the heck out of it or because you're looking to adopt 3-Way SLI. Otherwise, save some money and buy one of the less expensive X58 boards.

Gigabyte EX58-Extreme

Perhaps the most visually striking X58-based board belongs to Gigabyte. Its EX58-Extreme's PCB and onboard cooling follow a consistent color scheme for the most part. Plus, color is used functionally to simplify installation. For example, six alternating white and baby blue memory slots make it easy to drop in a triple-channel memory kit without needing to reference the manual. (Sure this type of color-coding is fairly common, but it just seems more visually straightforward with three memory channels.) Two blue PCI-E x16 slots indicate the native 16-lane interfaces, while a third orange slot will only give you x8 signaling. The six SATA 3Gbps ports associated with Intel's ICH10-R southbridge sport the same baby blue hue as three of the memory slots; the four SATA 3Gbps ports driven by JMicron's JMB322 controllers are off-white, matching the other three slots and legacy PCI slots.

The sharp looks don't stop there, either. Gigabyte's Hybrid Silent-Pipe 2 cooling system covers the power circuitry, northbridge, and southbridge with gun-metal-grey heatsinks and painted copper heatpipes. A bundled Silent-Pipe module screws into the northbridge cooler, enhancing the passive system's cooling capacity and the expense of the board's only PCI-E x1 and x4 slots. Fortunately, there's a built-in alternative for fans of liquid-cooling who don't want to block off the PCI-E slots. The northbridge heatsink doubles as a waterblock, accepting 7.5mm ID (inner diameter) and 10mm OD (outer diameter) tubing. So, if you're already planning on watercooling a Core i7 920 and overclocking it with

Color is used functionally to simplify installation.



EX58-Extreme

\$349

Gigabyte

www.giga-byte.com



Specs: Intel X58/ICH10-R; triple-channel DDR3-1333; Slots: 3 PCI-E x16, 1 PCI-E x4, 1 PCI-E x1, 2 PCI; CrossFireX/SLI support; Ports: 103Gbps SATA; 2 Gigabit Ethernet; northbridge watercooling support; bundled northbridge passive air cooler



X58 Eclipse

\$359

MSI

www.msicomputer.com



MSI's X58 Eclipse is the dark, brooding submission.

Specs: Intel X58/ICH10-R; triple-channel DDR3-1333 (up to 24GB); Slots: 3 PCI-E x16, 2 PCI-E x1, 2 PCI; CrossFireX/SLI support; Ports: 10 3Gbps SATA, 2 eSATA; 2 Gigabit Ethernet; bundled X-Fi 8-channel PCI-E controller

water, tying the EX58-Extreme to the circuit shouldn't be difficult at all.

As with Asus' Rampage II Extreme, the EX58-Extreme's three PCI-E x16 slots are spaced to accommodate double-wide cards. And like the Rampage, an oversized card plugged in to that third slot will extend past the bottom of the board, requiring an accommodating chassis. This won't be an issue for most folks: Go with standard SLI or a pair of Radeon HD 4870 X2s in CrossFire and you'll have more than enough space.

The board's rear I/O panel is rife with connectivity, but not the "quad-everything" excess we saw Gigabyte implement with its EP45-DQ6. The EX58-Extreme hosts PS/2 keyboard and mouse ports, eight USB 2.0 ports, a pair of RJ45 ports tied to Realtek's latest RTL8111D PCI-E controllers (with jumbo frames support), one FireWire 400 port, six 1/8-inch mini-jacks for analog audio, and digital output through S/PDIF and coaxial connections. There's also a clear CMOS button used to reset the BIOS after an unsuccessful overclock attempt. Just be careful not to

accidentally press it as you reach back for an available USB port.

We have to appreciate Gigabyte's attention to detail in laying out the EX58-Extreme. Unused FireWire headers were covered with removable caps to prevent bent pins. The front panel connectors are surrounded with plastic for the same reason. A push-button power switch is located next to the memory slots within easy reach inside or outside of a chassis. Several LED arrays provide a quick indication of voltage to the CPU, northbridge, memory, and southbridge; temperature of the CPU and northbridge; and degree of CPU overclocking.

Performance-wise, the EX58-Extreme placed toward the top of our charts. We did notice that the board gave itself a small advantage by adding a couple of extra tenths of a megahertz to the BCLK frequency, yielding a core clock 30 to 40MHz higher, according to CPU-Z. This wasn't a behavior noted on either of the Asus boards, but MSI's Eclipse did do the same thing. Stability wasn't affected, though, and the resulting

scores were measurably faster than Intel's DX58SO.

MSI X58 Eclipse

If Gigabyte's EX58-Extreme is the bright, cheery-looking entry in the roundup, with its baby blue and white color scheme, then MSI's X58 Eclipse is the dark, brooding submission. A black PCB comes loaded with black and blue slots and interfaces. Like Gigabyte, MSI uses color to make setup a little bit simpler.

The principal PCI-E x16 slots are black, and a third is blue. But whereas competing boards split the X58 chipset's second x16 link into a pair of x8s when three graphics cards are installed, MSI borrows lanes from Intel's ICH10-R southbridge to run the third slot at x4 signaling rates. Thus, this probably should not be your top pick for 3-Way SLI. Should you go that route anyway, you'll face the same challenge as the other 3-Way SLI-compatible competitors: a dual-slot card that hangs over the bottom of the motherboard.

Chipset cooling on the X58 Eclipse is simple. One array of copper fins covers the power circuitry (MSI only arms the board with six-phase power, though this never emerged as an issue during testing), while two smaller heatsinks connected by a pair of heatpipes cool the northbridge and southbridge.

The board's rear I/O panel is a little unconventional but great if you're looking to connect high-speed storage for external backup. You'll find a pair of 3Gbps eSATA ports, eight USB 2.0 ports, and a FireWire 400 port. You can also connect to networked storage through either of the Eclipse's Gigabit ports, though MSI goes with Realtek's older RTL8111C controllers, which lack jumbo frames support.

Our principal gripe with this board is that the X58 Eclipse is pricier than Asus' P6T Deluxe, and we can't help but think that some of the cost is due to a questionable accessory bundle. For example, its add-on PCI-E sound card, branded the X-Fi Xtreme audio card, is really nothing more than an HD Audio codec with

eight-channel output and optical connectivity. It does not feature the EMU20K1 controller lauded for its hardware acceleration and is, as a result, questionably named. The bundled GreenPower Genie is a hardware device that sits between MSI's motherboard and your power supply, measuring and reporting voltage in real time through an included application. It's cool, but something we could do without. Finally, the D-LED 2 display system

reports error messages and system information during operation on an OLED screen that plugs right in to the motherboard. Perhaps the most useful addition in the bundle, the D-LED module itself plugs straight into the motherboard and feels somewhat flimsy.

Fortunately, the X58 Eclipse's real-world performance is at least on par with the platforms from Asus and Gigabyte. Moreover, the board offers plenty of

overclocking options in its Cell (BIOS) menu, in addition to an onboard set of DIP (dual in-line package) switches used to hardwire higher BCLK frequencies. So, you can drop in a Core i7 920 running at 2.66GHz (133MHz with 20X multiplier), flip a couple of switches, and enjoy the same chip running at 3.3GHz (166MHz, 20X) with little effort. ▲

by Paul Cross

How We Tested

Each of our X58-based platforms was armed with Intel's latest Core i7 965 Extreme processor and 6GB of OCZ DDR3-1333 memory running a triple-channel configuration. Of course, this also meant shifting to Windows Vista Ultimate x64, which was able to recognize all of the available memory and had no problems with drivers or benchmarks. We also employed Intel's X25-M 80GB

solid-state hard drive in an effort to minimize any I/O bottlenecks such a fast platform might otherwise incur. Note also that the 965 Extreme requires a beefy cooler; we used Thermalright's Ultra 120 Extreme. We used the same heatsink/fan combination for all overclocking tests using Intel's less-expensive Core i7 920 processor, too.

X58 Power Play

	Intel DX58SO (for comparison)	ASUS P6T Deluxe	ASUS Rampage II Extreme	Gigabyte EX58-Extreme	MSI X58 Eclipse
3DMark Vantage					
Overall Score	P15509	P15811	P15216	P15150	P15187
GPU Score	14501	14817	14161	14035	14088
CPU Score	19597	19794	19595	19888	19831
Far Cry 2 (No AA/AF)					
1,920 x 1,200	36.77	37.11	37.2	37.37	37.49
2,560 x 1,600	22.76	22.95	22.97	23.11	23.27
PCMark Vantage					
Overall	10724	11317	10314	11230	11122
Memories	7551	7169	6773	7761	7900
TV And Movies	5121	5428	5080	5132	5551
Gaming	17796	17123	17253	16782	18064
Music	9178	9246	7833	8281	9595
Communications	7545	7794	7577	8613	8230
Productivity	13353	16035	15000	15909	14455
HDD	14918	20022	16098	18644	19833
Mainconcept (MPEG-2 to H.264 Conversion; minutes:seconds)					
	1:26	1:24	1:25	1:25	1:26
Xvid encoding (minutes:seconds)					
	2:51	2:48	2:46	2:47	2:48
Sandra Memory Bandwidth					
Integer Buffered iSSE2	22.49GBps	22.95GBps	23.26GBps	23.19GBps	22.73GBps
Floating Point Buffered iSSE2	22.47GBps	22.96GBps	23.25GBps	23.18GBps	22.71GBps
Price					
	n/a	\$329	\$399	\$349	\$359
CPUs					
	n/a	●●●	●●●●●	●●●●●	●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

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Lenovo ThinkPad W700

If you were to think about specific manufacturers and classes of notebooks, you might think of Dell's XPS line for all-out, over-the-top, DTR (desktop replacement) gaming machines. At the opposite end of the spectrum, Asus' Eee PC is a name that's virtually synonymous with netbooks. If we take this view one step further and consider business-oriented portable workhorses, then there's little doubt that Lenovo's ThinkPad W series will be at the forefront of consumers' minds. In the DTR market there's another niche known as the "workstation notebook." These are powerfully specified machines, set up to provide the CAD, 3D graphics, or multimedia professional all the tools and horsepower needed to get the job done.

Although there is a 15-inch version of Lenovo's ThinkPad W series (the W500), we decided to take a look at the 17-inch ThinkPad W700, which also is the first notebook to sport a fully functional Wacom digitizer in its palm rest. If you're the type that could use a small digitizer in a notebook for applications such as 3ds Max, Cinema 4D, CorelDraw, AutoCAD, etc., the W700's 80 x 120cm (HxW) digitizer pad works amazingly well with the included pen, which snaps into the side of the notebook. It certainly will save you from lugging around a portable USB digitizer, at least.

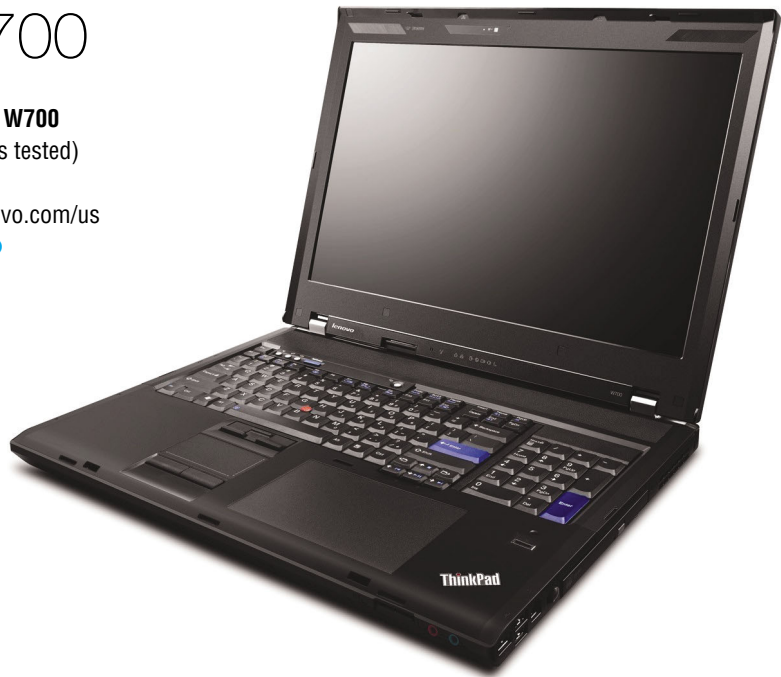
Beyond that, the ThinkPad W700 means serious business, with Intel Core 2 Duo T9600 and X9100 dual-core processors, as well as the quad-core QX9300, available for configuration. The W700's system memory options max out at 4GB of PC3-8500 DDR3, and mass storage options include a pair of 320GB hard drives in a RAID 0 or 1. For its 3D graphics, you can choose from either a 48-core Nvidia Quadro FX 2700M engine with 512MB of memory or a 128-core Quadro FX3700M with 1GB of frame buffer memory. There's also an available Blu-ray drive option for a pretty steep \$450, if you need it in your everyday workflow or perhaps for all-important downtime entertainment purposes. (We won't tell.)

ThinkPad W700

\$3,684 (as tested)

Lenovo

www.lenovo.com/us



The build quality of the ThinkPad W700 is classic, no-compromise ThinkPad construction, with tight tolerances and a very clean fit and finish. It's built with the same heavy-duty plastic composite as all ThinkPads and provides a rigid, strong feel with a fingerprint-resistant surface.

What's perhaps more impressive is the W700's absolutely gorgeous 17-inch LCD panel, which has a 1,920 x 1,200 native resolution. This panel offers the professional a ton of HD-ready screen real estate, and its image quality is crisp and vibrant, at 400cd/m² of brightness. This LCD is capable of displaying up to 72% of the Adobe RGB color space, which is important for professionals who need high color-fidelity between source images and on-screen output.

In terms of performance, as you might expect of a system with these specs, the ThinkPad W700 breezed through our battery of standard benchmarks, as well as our SPECviewperf tests. There's no question: The Lenovo ThinkPad W700 is a high-quality portable workstation that meets the needs of a truly demanding multimedia professional. ▲

by Dave Altavilla

Benchmark Numbers Lenovo ThinkPad W700

3DMark Vantage

Overall	4506
CPU	5449
GPU	4261

3DMark06

	10429
--	-------

SiSoft Sandra XI

CPU Arithmetic	25,880
CPU Multimedia	158,080
Memory Bandwidth	5.66GBps
Memory Latency	104ns
Disk Speed	110MBps

SPECviewperf 10

3dsmax-04	35.25 (up to 8XAA)
catia-02	44.14 (up to 4XAA)
ensight-03	37.24 (up to 2XAA)
maya-02	121.04 (up to 2XAA)
proe-24	42.93 (up to 4XAA)
sw-01	82.42 (up to 4XAA)
tcvis-01	23.47 (up to 4XAA)
ugnx-01	27.06 (up to 4XAA)

Specs: CPU: 2.8GHz Intel Core 2 Duo T9600; Chipset: Intel 945/ICH9R; RAM: 4GB DDR2-1066; HDD: 2x Hitachi 7K200 160GB (RAID 0); GPU: Nvidia Quadro FX 3700M; 17-inch LCD (1,920 x 1,200); OS: Windows Vista Ultimate SP1

AMD ATI Radeon HD 4830

The almost mutually exclusive terms “budget” and “gamer” get thrown together a lot, but if your gaming doesn’t extend beyond WoW, Spore, and *The New York Times*’ daily crossword, then you probably don’t follow graphics cards. For less than \$130, ATI’s Radeon HD 4830, which fills the gap between the enthusiast 4850 and the mainstream 4670, dares even cash-strapped gamers to enable more effects, turn up the AA and AF, and play at higher resolutions.

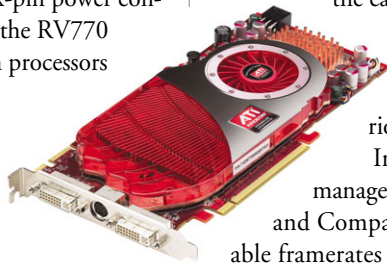
The Radeon HD 4830 features a single-slot heatsink and a six-pin power connector. ATI pared down the RV770 GPU by disabling stream processors

(640 vs. 800 for the 4850/4870) and texture units (32 vs. 40 for the 4850/4870). Onboard memory consists of 512MB GDDR3 running on a 256-bit bus and clocking in at 900MHz. The engine clock is a modest 575MHz, and although ATI tells us that factory overclocking is more appropriate for the 4850s and 4870s, MSI was offering a 585MHz version as we went to press. The one complaint we have is that

the card somehow features that

same 110-watt TDP as the superior 4850.

In the tests, the 4830 managed to run S.T.A.L.K.E.R. and Company of Heroes at playable framerates at 1,600 x 1,200.



ATI Radeon HD 4830

\$129

AMD

ati.amd.com



Specs: GPU: Radeon HD 4830; Core clock: 575MHz; Memory: 512MB GDDR3 (900MHz); 640 stream processors

Benchmark Results

	Gigabyte 9800 GT	ATI Radeon HD 4830
3DMark Vantage Overall	P5932	P5657
3DMark GPU Score	4714	4968
GPU1 (fps)	13.82	13.79
GPU2 (fps)	13.95	15.34
3DMark CPU Score	24084	9685
CPU1 (Plans/s)	1312.79	1311.23
CPU2 (Steps/s)	82.6	13.57
Company of Heroes (4XAA)	38.5	39.6
S.T.A.L.K.E.R.	40.6	52.8
Crysis	14.29	14.75
World in Conflict (4XAA, 4XAF)	21	26
Company of Heroes (4XAA)	15.6	18.9
S.T.A.L.K.E.R.	25.9	30.8
Crysis	1.67	7.35
World in Conflict (4XAA, 4XAF)	6	13

Driver: nForce 178.24 & Catalyst 8.10

S.T.A.L.K.E.R. even remained playable at 2,560 x 1,600. As we expected, Crysis was a slideshow on both cards, but ATI’s offering did scrape an almost playable 26fps in World in Conflict, compared to the 9800GT’s 21fps. If the 4670 didn’t bowl you over, just a bit more cash will net you a significantly better card. ▲

by Andrew Leibman

Gigabyte GV-N98TZL-512H

The GeForce 9800GT is the follow-up to the highly successful 8800GT, and for this refresh, Nvidia seems to have adopted the adage “if it ain’t broke, don’t fix it”: The 9800 GT is based on the same G92 core found in its predecessor.

Compared to the 8800GT, the GeForce 9800GT only boasts Nvidia’s Pure Video HD and support for Hybrid SLI and HybridPower, and the latter two features can only be taken advantage of on a capable Nvidia-based motherboard. Gamers are in for a more immersive gaming experience in select games, including Gears of War, Mass Effect, UT3, and Mirror’s Edge, thanks to Nvidia’s PhysX technology. CUDA (Compute Unified Device Architecture) also works with this card, which lets the PC apply the raw parallel

processing power of the GPU to nongraphics tasks, such as video and audio encoding.

Gigabyte saw fit to drop the reference cooler in favor of a circular copper Zalman heatsink, which effectively turns what was a single-slot reference card into a dual-slot card. The Gigabyte GeForce 9800 GT features 512MB GDDR3 onboard memory running over a 256-bit bus, but sadly, the core and memory clocks remain unchanged at the stock settings of 600MHz and 1,800MHz (effective), respectively.

We tested the Gigabyte’s 9800GT against ATI’s newly released Radeon



GeForce 9800 GT

\$123

Gigabyte

www.gigabyte-usa.com



HD 4830, and Company of Heroes and Crysis were a draw at 1,600 x 1,200. S.T.A.L.K.E.R. and World in Conflict ran significantly better on the ATI card at both resolutions, though the card was selling for slightly more than this card. Gigabyte’s 9800GT also comes with Gamer HUD overclocking software, making this a good option for DIY tweekers.

(Editor’s note: Please see our review of the AMD ATI Radeon HD 4830, above, for performance data.) ▲

by Andrew Leibman

Specs: GPU: GeForce 9800GT; Core clock: 600MHz; Memory: 512MB GDDR3 (900MHz); 112 stream processors

Test Specs: 2.67GHz Intel Core 2 Quad Q6700, Evga nForce 790i Ultra SLI motherboard, 2GB of DDR3-1333, 74GB Raptor, Corsair HX1000W PSU

GameRigs EGO

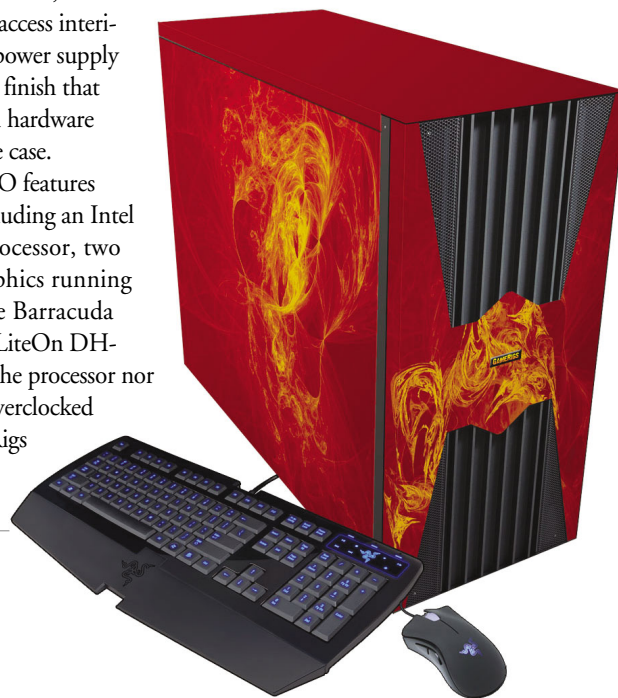
Known for its line of PCs that feature officially licensed artwork from popular games, GameRigs utilizes a “baked on” application process that makes the design on the case resistant to scratches and cuts. The EGO is a flame-embazoned desktop that’s priced between GameRig’s affordable HEX and top-notch OMG system. With its solid, clean system design, the EGO is aptly named for those who enjoy showing off their PC.

From a distance, the EGO’s laser-cut effects appear handcrafted, and close up we were impressed by the depth of red and orange hues on the case. For airflow, the door has two quadrilateral cutouts with mesh faceplates that allow the case’s front panel fans to move outside air into the case. We also like that the front-panel door latches to the case, ensuring that the solid metal door stays shut when you close it. GameRigs did a good job of running the cables behind the motherboard, which results in a clean, easy-to-access interior. The Ultra X2 750W power supply features a mirrored glossy finish that neatly reflects the internal hardware when you work inside the case.

On the whole, the EGO features established hardware, including an Intel Core 2 Quad Q9950 processor, two GeForce 9800GTX graphics running in SLI, a 500GB Seagate Barracuda 7200.11 hard drive, and LiteOn DH-401S BD drive. Neither the processor nor the graphics cards were overclocked on the EGO, but GameRigs told us that customers can call and request that

the system be overclocked, which costs a flat fee of \$35. GameRigs did alter the timings of the Crucial Ballistix DDR2-1066MHz modules to lower latency and improve performance in games. The particular EGO sent to us also included Bigfoot’s Killer NIC K1, as well as Razer’s Lycosa keyboard and DeathAdder mouse.

Because the EGO is a midrange PC, we knew it wouldn’t break any of our benchmark records. But in terms of performance, we’ve seen lower-priced systems deliver better frames per second in Company of Heroes (25.9), World in Conflict (10), and Crysis (3.4). The EGO achieved a near-playable resolution of 28fps in Crysis when we backed down the resolution to 1,900 x 1,200. Overclocking the processor would have helped the EGO in our Dr. Divx (4:44 [minutes: seconds]), POV-Ray 3.7 Beta (2,446pps), and WinRAR 3.71 (2:44) tests.



EGO

\$2,499 (as tested)
GameRigs
www.game-rigs.com



Specs: Intel Core 2 Quad @ 2.83GHz; Motherboard: Evga nForce 780i SLI FTW; RAM: 4GB Crucial Ballistix (PowerStix) DDR2-1066; HDD: 500GB Seagate Barracuda 7200.11; GPU: EVGA GeForce 9800 GTX (2x; SLI); PSU: Ultra X2 750W ATX; OS: Windows Vista Home Premium

If you’re willing to pay a little extra for an impressive-looking system, it’s worthwhile to check out GameRigs’ EGO and other custom designs. Alternatively, if you strictly are interested in performance, you may be able to find a more affordable desktop for the job. ▲

by Nathan Lake

Benchmark Results GameRigs Ego

3DMark Vantage	
Overall	P13380
GPU	11197
CPU	32211
Cinebench 10*	
Multithreaded (score)	11585
Multithreaded (min:sec)	1:16
Dr. Divx 2.0.1*	4:44
POV-Ray 3.7 Beta**	2446
PCMark Vantage Pro 1.0	
Overall	5220
Memories	4502
TV And Movies	3318
Gaming	5043
Music	4436
Communications	5106
Productivity	5543
HDD	3986
SiSoft Sandra Lite XII SP1	
Processor Arithmetic	
Dhrystone ALU (MIPS)	44,244
Whetstone iSSE3 (MFLOPS)	34,822
Processor Multi-Media	
Integer x8 iSSE3 (itps)	351,425
Floating Point x8 iSSE2 (itps)	227,150
Memory Bandwidth	
Integer Buffered iSSE2 (GBps)	6.63
Floating-Point Buffered iSSE2 (GBps)	6.61
WinRAR 3.71*	2:44
Crysis 1.1	3.4
Company of Heroes 2.1.0.2 (4XAA)	25.9
World In Conflict 1.005 (4XAA, 16XAF)	10
S.T.A.L.K.E.R 1.0005	52

* minutes: seconds

** pixels per second

Games tested at 2,560 x 1,600



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Mountain Mods Ascension CYO

Clear a space on your worktable, grab a screwdriver, and prepare yourself for an exciting new building experience with one of Mountain Mods' Ascension CYO (Choose Your Own) computer cases. Mountain Mods calls Ascension "hyper modular," meaning you can choose the pieces of your case and assemble them into almost any configuration imaginable, making the Ascension perfect for those of us who want a customized case and also want to build it.

When you order an Ascension case, you can choose your preferred side, top, and back panels; acrylic window color; and surface finish. I chose the Anodized



Black finish, which, along with UV green acrylic windows and lighted fans, gave the case a sleek and stylish look. For added customization, you can send an image to be etched into one of the acrylic windows. I chose to get an etching of the CPU logo; the work was flawless and added a personal touch to the system.

Assembling the case panels was relatively easy, even without following the online directions. At a massive 2 feet tall and 18 inches wide, the Ascension gives you plenty of room to work with, whether you need space for several hard drives or watercooling equipment. One feature I found useful was the design for mounting hard drives. Instead of

a traditional hard drive cage, hard drive brackets are included that let you attach up to three drives to any 120mm fan in the case, offering arrangement options, as well as cooling.

The Ascension had only a couple minor drawbacks. First, I ended up with more than one scratch from the sharp edges of the case. Second, the case comes with 5.25-inch drive cages (one or two, depending on the panels you choose), hard drive brackets, motherboard tray, and necessary screws; however, you'll have to purchase bay covers, fans, and other accessories separately, which can add up quickly.

Overall, the Ascension is a refreshing option for ultimate case customization and well worth the money you'll spend. ▲

by Kris Glaser

Ascension CYO

\$369.99

Mountain Mods

www.mountainmods.com



Specs: Dimensions: 18 x 24 x 18 inches (HxWxD); Material: Aluminum; Form factors: up to eATX; Bays: removable 5.25-inch cage holds up to five devices; HDD Bays: 2 120mm HD brackets (holds three HDs each)

Razer Moray

Razer wants you to know that its Moray in-ear noise-isolation gaming earphones are "the perfect complement to any mobile gaming device, such as the PSP, Nintendo DS, or any MP3 player." As far as we're concerned, there's no reason to doubt the quality of the Moray earphones when they weigh less than a single ounce (0.377 ounce, to be precise) and supply almost theater-like audio quality without ruining your ears' comfort level.

Available in black or white, Razer's versatile earphones will blend in with most of your iPod products or portable gaming consoles. The compact carrying case makes the Moray earphones travel-friendly, especially when you need to coil up the extra rubbery cord, and the airline adapter is an accessory any frequent flyer will appreciate, too.

To achieve an airtight seal inside your ear canal, Razer provides swappable small,

medium, and large rubber sleeves to properly isolate sound. Each malleable cushion was pleasantly snug, but once I decided which option was most comfortable (small), my ears were feeling ready for some tunes. However, after using the earphones for over an hour, the cartilage on my lower ear felt a bit irritated.

Annoyances aside, these gaming earphones effectively blocked 80 to 90% of all extraneous sounds, thanks to the passive noise reduction feature. I didn't expect Razer's "extended bass-driven stereo" to be too impressive, but I was surprised how the bass resonated in multiple songs from various music genres, including hip-hop, mainstream rock, and Brit-pop (in MP3 format). Mids were exceptionally clear—a synth riff here, a



backing vocal there.

Moreover, I noticed previously undetected in-game background noises, as compared to my over-the-ear headphones, during my test run of S.T.A.L.K.E.R.

To recap, I took into consideration the following criteria for this review: overall comfort, quality of sound levels (primarily bass), and product adaptability. On the whole, the Razer Moray earphones remained securely in place, didn't fizzle or pop, and packed up easily. ▲

by Joanna Safford

Razer Moray

\$39.99

Razer

www.razerzone.com



Specs: Frequency response: 20 to 1,100Hz; Audio pressure level: 110dB; Max rated input: 20mW; 1.3m cable length; 3.5mm miniplug; airline adapter

Eos Wireless Speakers For iPod

Want to wirelessly pipe audio from that new iPod you got for Christmas to up to five rooms in about as much time as it takes to say “sweet”? Check out the Eos Wireless Speakers, which ship with a dock/base station sporting two 1-inch neodymium drivers and small subwoofer and one wireless speaker with same drivers/subwoofer. You can add up to three more speakers (\$129.99 each) distanced up to 150 feet from the station indoors or up to 300 feet outdoors. Non-iPod owners can also get in on the fun via an auxiliary input.

Setup is as easy as docking an iPod and plugging the dock and each speaker into an individual power outlet. Each component’s power supply is detachable, with the power cord stretching about 2 feet. Proprietary GigaWave 2.4GHz technology provides frequency-hopping abilities for interference-free CD-quality audio. Onboard error-correction technology, meanwhile,

resends dropped packets, and buttons on the base conveniently cut audio to the speakers instantly and switch between iPod and auxiliary-connected devices. Also nice is the ability to set a unique ID to combat a neighbor’s wireless system.

I spread the base station and four speakers throughout two floors in my house, as well as on a front porch, garage, and deck outdoors, without incident. Usage near a microwave, cordless and cell phones, and electronics with Bluetooth installed didn’t trip up the Eos either. In addition to nano and classic iPods (all iPod models are supported), I used DAPs from Creative, Samsung, Toshiba, and SanDisk without problem. I also connected a home-theater system and portable DVD player with success. Integrated SRS WOW provides convincing surround-sound texture, though audio fell on the tinny side in my use. Bass output, meanwhile, noticeably lacked some oomph.



Wireless Speakers for iPod

\$249.99

IntelliTouch

www.eoswireless.com



Specs: 2.1 stereo surround-sound; two neodymium tweeters and one down-firing subwoofer in each speaker; SRS WOW technology; auxiliary input; GigaWave transmission technology with error correction

Available in black or white (both options sport silver grilles), the Eos’ hard-plastic construction should weather years of use. An infrared remote that can control an iPod’s volume (setting the volume on individual speakers is a manual task), auxiliary cable, and iPod adapters are included. ▲

by Blaine Flamig

Palit Radeon HD 4850 Sonic

The early third-party graphics cards based on the latest GPUs are typically pretty standard. Things only get interesting later, when cards sporting unique designs, heavy-duty heatsinks, and higher clocks arrive. All of the above is true with Palit’s Radeon HD 4850 Sonic.

Palit strapped the Radeon HD 4850 Sonic with a dual-slot heatsink that features a 70mm fan, a copper-cored heatsink, and aluminum fins joined with a pair of nickel-plated heatpipes. The 512MB GDDR3 memory is clocked at 1,000MHz and runs on a 256-bit bus. The core clock is upped to 685MHz. Another departure you’ll notice is the 8-pin auxiliary connector, which doubles the connector-supplied juice from 75 (for the stock 4850) to 150W, effectively obliterating the voltage wall for overclockers. Another singularity is the 3-phase power subsystem, which employs an extra inducer and capacitors to decrease current, resistance, and EMI for added stability. Palit’s manufacturing expertise is evident on this card: Even accounting for the

above improvements, the firm still managed to shave more than an inch from the reference 9.5-inch 4850.

In tests, the 4850 Sonic managed just a 5fps deficit against the 4870 in 3DMark Vantage’s GPU tests and CoH. S.T.A.L.K.E.R. shined on the superior card by a greater margin, but Crysis and World in Conflict were within 3fps at both resolutions. The 4850 Sonic is a solid value and an even more solid performer for tweekers and nontweekers alike. ▲

by Andrew Leibman

Radeon HD 4850 Sonic
\$180
Palit
www.palit.biz



Specs: GPU: Radeon HD 4850; Core clock: 685MHz; Memory: 512MB GDDR3 (1,000MHz); 800 stream processors

Benchmark Numbers

	Palit Radeon HD 4850 Sonic	Sapphire Radeon HD 4870
1,280 x 1,024		
3DMark Vantage Overall	P7630	P8748
3DMark GPU Score	7113	8506
GPU1 (fps)	20.9	25.53
GPU2 (fps)	20.77	25.32
3DMark CPU Score	9581	9563
CPU1 (Plans/s)	1312.93	1309.3
CPU2 (Steps/s)	13.02	13.03
1,600 x 1,200		
Company of Heroes (4XAA)	50.9	54.4
S.T.A.L.K.E.R.	64.3	77.6
Crysis	19.72	23.1
World in Conflict (4XAA, 4XAF)	29	32
2,560 x 1,600		
Company of Heroes (4XAA)	25.3	30.6
S.T.A.L.K.E.R.	37.2	46
Crysis	9.86	11.61
World in Conflict (4XAA, 4XAF)	18	20
Driver: nForce 178.24 & Catalyst 8.10		

Test specs: 2.67GHz Intel Core 2 Quad Q6700; Evga nForce 790i Ultra SLI motherboard; 2GB of DDR3-1333; 74GB Raptor; Corsair HX1000W PSU

iBuyPower Gamer Paladin 998

If you like your desktop systems named after heroic champions or supporters of a strong cause, the Gamer Paladin 998 from iBuyPower is for you. We found that this particular system was at least a strong supporter of gaming, with its Intel Core 2 Quad Q9550, Palit Revolution 700 Deluxe GPU (ATI Radeon 4870 X2), and 4GB of OCZ Gold DDR-1333 memory.

The Gamer Paladin 998's components were housed in a Cooler Master HAF 932 case, and iBuyPower added red LEDs to the system fans and a red cold-cathode light at the bottom of the case. With its large side-panel window and 230mm fan grille, the 21.5-inches tall system gave off a distinctly devilish appearance. To keep the interior components visible, iBuyPower routed most of the cables behind the motherboard tray. The 230mm fans in the top, front, and side panels of the case kept air moving in and out of the case. Surprisingly, the Gamer Paladin 998 was relatively quiet, even when the system was under load.

The top of the front panel provides four USB ports, a FireWire port, an eSATA

port, and audio inputs. And the inclusion of a BD player and DVD burner covered both our media playback and backup needs. iBuyPower took advantage of the HAF 932's tool-less design: Optical and hard drives quickly slid into or out of the system. The liquid CPU cooler had short, thick tubing that would be extremely difficult to kink, and we like that the tubing doesn't block access to the internal components. In terms of design, iBuyPower's choice of OCZ's Gold line of memory nicely matches the gold heatsink on the Gigabyte motherboard.

We'd have liked to see iBuyPower overclock this system to really pump out the frames per second, but the builder tells us that iBuyPower does not provide overclocking services. Still, the Gamer Paladin 998 performed well in our game tests, including 29fps in Far Cry 2, 20fps in Crysis Warhead, and 54.4fps in Company of Heroes. In our synthetic tests, the Gamer Paladin 998 put up a pedestrian—considering the system's hardware—P12964 Overall 3DMark Vantage and 5176 Overall PCMark Vantage scores.



Gamer Paladin 998
\$1,999.99 (as tested)
iBuyPower
www.ibuypower.com
●●●●

Specs: Intel Core 2 Quad Q9550 @ 2.83GHz; Motherboard: Gigabyte GA-EP45T-DS3R; RAM: 4GB OCZ Gold DDR3-1333; HDD: 500GB Hitachi Deskstar; GPU: Palit Revolution 700 Deluxe (ATI Radeon 4870 X2); PSU: NZXT PP 800 (800-watt); OS: Windows Vista Home Premium (64-bit)

For an additional \$149, you can purchase the Gamer Paladin 998 in your choice of two-tone colors. Adding a little extra flair would separate this tall PC from the pack at your next LAN party. It's also worth noting that the HAF 932 case provides room for future upgrades, and the Gamer Paladin also has the airflow capability to handle extra components. ▲

by Nathan Lake

Benchmark Results

3DMark Vantage

Overall	P12964
GPU	13448
CPU	11701

Cinebench 10

Multithreaded (score)	12313
Multithreaded (min:sec)	1:10

Dr. Divx 2.0.1*

POV-Ray 3.7 Beta**	2:20
--------------------	------

PCMark Vantage Pro 1.0

Overall	5176
Memories	4285
TV And Movies	4183
Gaming	5336
Music	4125
Communications	4930
Productivity	4747
HDD	3473

SiSoft Sandra Lite XII SP1

Processor Arithmetic

Dhrystone ALU (MIPS)	47,189
Whetstone iSSE3 (MFLOPS)	37,867

Processor Multi-Media

Integer x8 iSSE3 (itps)	374,846
Floating Point x8 iSSE2 (itps)	236,658

Memory Bandwidth

Integer Buffered iSSE2 (GBps)	6.71
Floating-Point Buffered iSSE2 (GBps)	6.71

WinRAR 3.71*

Crysis Warhead	2:44
Crysis 1.1	20.09
Company of Heroes 2.1.0.2 (4XAA)	21.67
Far Cry 2 (4XAA)	54.4
World In Conflict 1.005 (4XAA, 16XAF)	29
	37

* minutes: seconds

** pixels per second

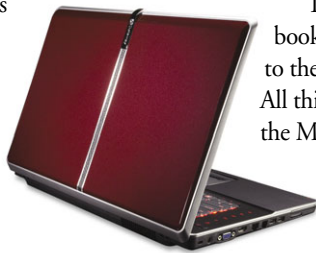
Games tested at 2,560 x 1,600

Gateway MC7803u

Targeting mobile enthusiasts who are interested in entertainment and looks, the Gateway MC7803u features an edge-to-edge seamless glass 16:9 wide-screen display. It also incorporates a modern automotive design, which includes a leather palm rest and polished jet-black casing. (A burgundy model is also available.) The keyboard has amber backlighting with touch-sensitive multimedia keys on both sides.

Holding true to its entertainment roots,

MC7803u
\$999.99 (as tested)
Gateway
www.gateway.com



the MC7803u has two headphone jacks on the front for sharing movies with friends, plus an HDMI v1.3 output for outputting video to high-def sets on the side. Plenty of other connectors are available, as well: You'll find a VGA output, four USB 2.0 ports (two on each side), and phone and Ethernet jacks on this notebook.

The MC7803u doesn't sport the highest resolution screen on the market today, but it does display a good-looking picture.

The MC7803u isn't the lightest notebook around at 7.7 pounds (in part due to the glass screen), but it's still portable. All things considered, for under \$1,000, the MC7803u offers respectable hardware and a decent feature set. ▲

by Jennifer Johnson

Specs: CPU: 2.0GHz Intel Core 2 Duo Processor T5800; Memory: 4GB DDR2-667MHz, dual channel; HDD: 320GB at 5,400rpm; GPU: ATI Mobility Radeon HD 3650 512MB; OS: Windows Vista Home Premium 64-bit SP1

Benchmark Numbers Gateway MC7803U

3DMark06 Pro 1.1	
Overall	3506
SM2.0	1144
HDR/SM3.0	1570
CPU	1731
Cinebench 10	
Multithreaded (min:sec)	3:24
Multithreaded (score)	4323
Dr. DivX 2.0.1*	7.44
PCMark Vantage Pro 1.0**	
Overall	3280
Memories	2298
TV And Movies	2433
Gaming	2716
Music	3098
Communications	3522
Productivity	2862
HDD	2985
POV-Ray 3.7 Beta***	903.2
WinRAR 3.71*	4:39
S.T.A.L.K.E.R.	14.12
World in Conflict	5

* minutes:seconds

** Tested at 1,368 x 768

*** pixels per second

**** Games tested at notebook's native resolution: 1,366 x 768.

Razer Salmosa

For those who are new to the gaming world, the Razer Salmosa is a good gaming mouse. But for gaming veterans, the Salmosa might not offer enough buttons, but the software boots its functionality and the hardware is top-of-the-line.

The Salmosa is lightweight and compact, making it great for fingertip-grip gamers, women, or those with small hands. It also has Ultraslick Teflon feet that allow it to easily glide along your mouse pad while playing multiplayer online and RTS games, which it's designed specifically for.

Playing Company of Heroes, the Salmosa's 1,800dpi and 6,400fps allowed me to be quick, precise, and in control, while avoiding misclicking. Even in FPS games, such as Far Cry, the precision and manageability was good. The 1,000Hz/1ms Ultrapolling rate and 60ips (inches per second) measurement were especially helpful.

In addition to dpi, fps, and Ultrapolling, the Salmosa features Razer's "On-the-Fly Sensitivity" adjustment (which lets you change your sensitivity settings without leaving the game), toggle switches on the bottom of the mouse that let you adjust the dpi (dots per inch) and the polling rate (how many times a tool sends information to your PC), and three programmable Hyperresponse buttons. The lack of buttons is a con, but for a gaming novice, it might be nice not to have to bother with more than the standard three.

Being able to change the button assignments was useful, as was the ability to control settings, such as the sensitivity and speed, quickly through the Salmosa Customizer. Once you've changed the settings (such as the double-click speed), you can test the changes to be sure they're what you want to use. This lets you switch between

using the Salmosa for games and using it for everyday computer use.

The Salmosa Customizer is set up in a straight-forward manner but still has plenty of advanced functions. Still, it's important to note that I had command prompt issues with Windows Vista, which is something to watch out for. If you have the same issue I did, you'll be unable to double-click your mouse when it is not specifically programmed to do so in the Customizer.

The Salmosa has good hardware and software. The lack of buttons might not appeal to seasoned gamers, but that could actually benefit gaming newcomers. ▲

by Tessa Breneman

Salmosa
\$39.99
Razer
www.razerzone.com



Specs: DPI: 1,800; Ultrapolling: 1,000Hz/1ms response time; IPS: 60 to 120; Compatibility: Windows XP/XP64/Vista; Frames Per Second: 6,400; Dimensions: 37 x 63 x 115mm (HxWxD); Weight: 104g; three Hyperresponse buttons; Ambidextrous design

Toshiba XD-E500

Toshiba dropped its support for HD DVD nearly a year ago, grudgingly conceding that BD is the *de facto* high-def optical disc format in much of the world. Still, the company hasn't exactly embraced Sony's format quite yet.

The XD-E500 is Toshiba's budget thrust at Blu-ray's expensive heart. It's a firmware-upgradeable, upconverting DVD player with extra downstream processing options that take users' existing DVD collections to within a few whiskers of high-def quality.

In 1080p mode over HDMI, you can select among the XD-E500's special XDE (eXtended Detail Enhancement) picture modes. Sharp adds edge definition but doesn't bother trying to sharpen out-of-focus background objects. Color (which includes Sharp) boosts blues and greens. Contrast (which also incorporates Sharp and gave us the best picture quality) makes details pop in dark scenes.



XD-E500

\$149

Toshiba

www.tacp.toshiba.com



Specs: HDMI, component video, S-Video, composite video, 2-channel analog audio, optical and coaxial digital audio outputs; 24p playback

On an LED-backlit Samsung LN-T4681F HDTV, the XD-E500's smart detail enhancement produced a noticeably sharper picture than did a \$229 Oppo DV-981HD with Faroudja's DCDi (Directional Correlation Deinterlacing) upscaling. It even held its own against a BD version of "Corpse Bride," played by a \$299.99 Samsung BD-P1500, although only at a normal viewing distance: The illusion rapidly unravels the closer you sit to the screen.

The difference between the XD-E500 and the BD-P1500 was most noticeable around the letters of the opening credits and the edges of stop-motion animated

objects. The live-action DVD and BD versions of "X-Men: The Last Stand" looked extremely similar in these two players.

The Toshiba's drawbacks include SVCED video artifacts; a lack of DTS decoding; and an inability to letterbox 4:3 content at all, let alone automatically, as can the Oppo. The lack of surround-sound analog outputs may irk some users, too, and there's no HDMI cable in the box. Still, you'll have to spend nearly twice as much (and buy BDs) to get a disc player with a sharper picture. ▲

by Marty Sems

Seagate Barracuda 7200.11 1.5TB



Barracuda 7200.11 1.5TB ST31500341AS

\$225

Seagate

www.seagate.com



Besides price, hard drives can still holler "neener, neener" at SSDs about capacity. You would have to consult the likes of enterprise vendors Bit-micro or Texas Memory Systems to find solid-state storage with room for 1.5TB, and you'd best have a free hand with your capital budget before you dial.

Seagate's latest Barracuda thunders ahead with a 500GB increase in capacity—the industry's biggest single jump—over the previous edition. You'll get roughly 1.36TB with default NTFS formatting.

This 7200.11's performance varied greatly from run to run in HD Tach. Average read rates teetered crazily between 78MBps and 101MBps, with average writes careening from 42 to 53MBps.

The Barracuda nearly catches WD's 300GB VelociRaptor in sequential read rates (sometimes), although the smaller 10,000rpm drive leaves it behind in most other metrics.

Low average write rates seem to hobble this king-sized Seagate, and it shows in comparison with WD's 7,200rpm Caviar Black 1TB. Then again, that drive has fewer platters to spin and fewer heads to swing around, not to mention only two-thirds the capacity. And in its defense, the 7200.11 shows up Samsung's lauded 7,200rpm SpinPoint F1 at nearly every turn, except for those pesky write rates again. ▲

by Marty Sems

Benchmark Results

PCMark Vantage 1.0.0 (Nov. 07 patch)

HDD Score (points)	5090
Defender (MBps)	22.9
Gaming (MBps)	14.7
Photo Gallery import (MBps)	49.5
Vista startup (MBps)	19.1
Movie Maker edit (MBps)	41.4
Win Media Ctr (MBps)	119.2
WMP music add (MBps)	10.8
Application Loading (MBps)	5.9

HD Tach RW 3.0.4.0, Long Bench

Read rates, average/maximum (MBps)	101.7/135
Write rates, average/maximum (MBps)	53.2/110
Random access time (ms)	15.5
Burst read rate (MBps)	231.9

Iometer 2006.07.27

File Server (IOPS)	103.35
Web Server (IOPS)	128.43

Test specs: Vista Home Premium SP1 (32-bit), Core 2 Extreme Q6850 (3GHz), 4GB DDR3 (1,333MHz), Intel DX48BT2, ICH9R controller

Specs: 3Gbps SATA; 7,200rpm; 8.5ms advertised read seek; 32MB cache; NCQ; 4 platters/8 heads; 27 to 32dB; 8.3 to 10.8W; 277Gbps; 350G (nonoperating, 1ms); 5-year warranty

Cooler Master ATCS 840

It's been almost a decade since Cooler Master introduced its first ATCS (Active Thermal Convection System) line of aluminum cases. And to commemorate the release of the originals, Cooler Master is introducing a case reminiscent of the company's first aluminum chassis, updated with many modern amenities: the ATCS 840.

The ATCS 840 is an absolutely gargantuan full tower that can accommodate any of today's high-end hardware. It stands almost 23 inches high and is just shy of 25 inches deep, with multiple 230mm cooling fans included (two for exhaust at the top and one for intake at the lower front). The top of the case is home to a pop-up panel that houses USB, FireWire, eSATA, and audio connectors.

The front of the case is sleek and clean with only the drive bays visible. A removable fan filter sits behind the case's lower

Specs: Dimensions: 22.83 x 9.57 x 24.8 inches (HxWxD); Weight: 29lbs.; Motherboard compatibility: MicroATX, ATX, E-ATX; Bays: 6 5.25-inch, 7 3.5-inch (6 internal, 1 external); Expansion slots: 7; Cooling fans: 3 230 x 30mm (one intake, two exhaust); Front panel connectors: 4 USB, 1 FireWire, 1 eSATA, microphone, headphone

front-mounted fan, minimizing dust intake. The rear panel has a typical array of slot locations with a PSU mount, optional fan mounts, and grommets cut to accommodate liquid-cooling tubing. Speaking of liquid-cooling, I should also note that the top-mounted 230mm fans can be removed to mount a radiator for a liquid-cooling setup.

Working on the ATCS 840 is easy, thanks to tool-less entry, drive mounts, and a removable motherboard tray. The stock 230mm fans move a substantial amount of air yet remain very quiet. Cooler Master includes a video card module for users

ATCS 840

\$279

Cooler Master

www.coolermaster.com



wanting to enhance the ATCS 840's cooling capabilities further.

Considering the recent influx of \$300+ aluminum cases, the Cooler Master ATCS 840 almost seems like a bargain. It's big and not exactly cheap, but if you can afford it, the ATCS 840 is worth every penny. ▲

by Marco Chiappetta



Power Color HD4830 512MB GDDR3

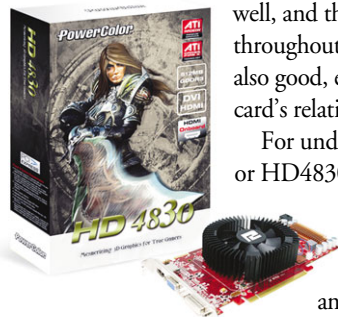
To further flesh out its lineup of sub-\$200 graphics cards and fill a price gap between the \$80 Radeon HD 4670 and \$160ish HD 4850, AMD recently launched the Radeon HD 4830. Reference Radeon HD 4830 cards look essentially identical to the more powerful HD 4850, but according to AMD, board partners are likely to release a number of nonreference Radeon HD 4830 cards into the wild.

Take the Power Color HD4830 512MB GDDR3, for example. Although it has the same 575MHz RV770 core with 640 stream processors and 512MB of GDDR3 RAM (900MHz) as the reference Radeon HD 4830, Power Color's offering uses a shorter PCB and a custom GPU cooler. Its array of outputs is also somewhat unique, at least in the sub-\$200 current graphics card landscape.

The HD4830 512MB GDDR3 is outfitted with a dual-slot aluminum cooler

that sits directly atop the GPU. And its output array consists of dual-link DVI, VGA, and DisplayPort outputs. During testing, the cooler worked quite well, and the card remained quiet throughout. 3D performance was also good, especially considering the card's relatively low price point.

For under \$130, the Power Color HD4830 512MB GDDR3 is a huge step up in performance from any integrated graphics GPU and a great low-budget alternative to those who can't quite afford an HD 4850. ▲



Specs: GPU: ATI Radeon HD 4830; Core clock: 575MHz; Memory: 512MB GDDR3 (900MHz); Memory interface: 56-bit; 640 stream processors; Interface: PCI-E 2.0
Test Specs: 3GHz Core 2 Extreme QX6850, Asus P5E3 Premium, 2GB DDR3-1333, Windows Vista Ultimate SP1 (32-bit). Drivers: ATI Catalyst v8.10b (w/ DirectX Aug 2008 Redist.)

HD4830 512MB GDDR3

\$129

Power Color

www.powercolor.com



Benchmark Results

3DMark06

Overall Score	11624
Shader Model 2.0 Test	4343
Shader Model 3.0 / HDR Test	5096

3DMark Vantage (Enthusiast Preset)

Overall Score	6167
GPU Test 1	15.29
GPU Test 2	16.32

1,280 x 1,024

Half Life 2: Episode 2 (4XAA/16XAF)	118.47
Enemy Territory: Quake Wars (4XAA/16XAF)	88.2
Unreal Tournament 3	89.51
Crysis (Medium Quality)	62.21

1,680 x 1,050

Half Life 2: Episode 2 (4XAA/16XAF)	91.48
Enemy Territory: Quake Wars (4XAA/16AF)	68.5
Unreal Tournament 3	82.72

Alienware Area-51 X-58

When it comes to buying a boutique system, the price tag hanging from the chassis is usually as far out as the components inside. But once in a while, we find dangling before our eyes a price tag worthy of consideration. One of these price tags belongs to Alienware's Area-51 X-58 desktop, which crams plenty of intense features into a reasonably priced package and delivers a worthwhile performance.

Our test unit came with some of the newest and fastest parts available. To start, the X-58 sports its namesake, the Intel Extreme Series DX58SO motherboard, and is further equipped with an Intel 3.2GHz Core i7 processor. With the Core i7's integrated memory controller and efficient QPI (QuickPath Interconnect, shared by the X58 chipset on the DX58SO), these two components are the foundation for one promising system. Add to them an equally promising pair of ATI Radeon 4870 X2s rigged for CrossFireX, 12GB of RAM, and 64-bit Vista, and you are looking at some serious firepower.

Alienware gives buyers a variety of choices where case, LED light, and fan colors are concerned. Our X-58 arrived in a glossy black chassis, highlighted with blue LED lights and fans, which looked great but was prone to easy fingerprinting. I took a liking to the X-58's sleek, symmetrical design and was even more appreciative of some of the features within. Its tool-less design, for instance, makes it easy to add or remove components such as optical or hard drives. The wireless fan sensor located on the side panel is another practical touch and eliminates the wire connecting the fan to the power supply or motherboard. The inside of the X-58 is free of clutter; all wires are routed efficiently and secured for optimum airflow, which helped



Area-51 X-58

\$6,373

Alienware

www.alienware.com



dissipate the considerable heat the 4870 X2s produced during testing.

The X-58 performed well for us, with especially high marks in multimedia tests. Cinebench finished at 46 seconds, while PCMark Vantage had a high overall score and posted high in all its multimedia categories. Gaming scores were suitable and reflected the X-58's inclusion of the latest hardware, with Crysis finishing at an admirable 33fps.

Any qualms with the X-58 are largely subjective, such as the size of the case, which stands 19 inches tall and reaches 25 inches in depth. This is great for expandability options but also eats up desk space and makes for a heavy LAN load.

Overall, Alienware's X-58 is a solid system that beats its competition with customizable options and a reasonable price tag. ▲

by Kris Glaser

Benchmark Results

3DMark Vantage

Overall	P21678
GPU	22032
CPU	20680

Cinebench 10*

Multithreaded (score)	19118
Multithreaded (min:sec)	0:46

Dr. Divx 2.0.1*

POV-Ray 3.7 Beta**	4,192
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PCMark Vantage Pro 1.0

Overall	11195
Memories	8161
TV And Movies	5757
Gaming	14321
Music	10886
Communications	8045
Productivity	13396
HDD	20492

SiSoft Sandra Lite XII SP1

Processor Arithmetic

Dhrystone ALU (MIPS)	81,099
Whetstone iSSE3 (MFLOPS)	68,547

Processor MultiMedia

Integer x8 iSSE3 (itps)	55,391
Floating Point x8 iSSE2 (itps)	386,914

Memory Bandwidth

Integer Buffered iSSE2 (GBps)	17.39
Floating-Point Buffered iSSE2 (GBps)	17.40

WinRAR 3.71*

Crysis Warhead	21
----------------	----

Crysis 1.1

World In Conflict 1.005 (4XAA, 16XAF)	59
---------------------------------------	----

FarCry 2

	67
--	----

* minutes: seconds

** pixels per second

Games tested at 2,560 x 1,600

Specs: CPU: Intel Core i7-965 Extreme @ 3.2GHz; Motherboard: Intel DX58SO; RAM: 12GB 1,066MHz DDR3; Storage: Extreme Performance (RAID 0) 256GB SSD; 2TB SATA 3Gbps 7,200rpm; GPU: ATI Diamond Radeon HD 4870 X2; PSU: Thermaltake 1,200W.

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The New MacBook Air, Much Like The Old MacBook Air

Apple finally introduced its redesigned notebook lineup a couple months ago, and the new MacBooks look and feel great; Apple managed to raise my expectations for build quality by another major step. It'll take a while for the competition to catch up, although I'm not sure if most will want to, given Apple's higher average selling price.

You still get cheated a bit on hardware, mainly on the memory side. Apple is still only shipping most of its machines with 2GB of memory by default, at a time when 4GB is where the rest of the market is moving.

Performance and battery life basically remain unchanged from the previous generation of MacBook/MacBook Pros, despite major changes to the hardware. Apple now uses smaller batteries but also a lower-power chipset and graphics core than it used in the last generation, which doesn't result in any substantive change in battery life but does make for lighter notebooks. CPU performance didn't really improve, either. The new chips are still 45nm Core 2s, but they have a faster FSB, which in a mobile environment at these clock speeds doesn't really help.

Graphics performance is improved, however, thanks to Apple's use of Nvidia's GeForce 9400M chipset instead of Intel's integrated graphics. Things like Exposé with a lot of open windows are faster, and Boot Camp users can actually game on the MacBook under Vista.

Apple also updated the MacBook Air, giving it the same GeForce 9400M chipset as the rest of the lineup and new CPUs (1.6GHz and 1.86GHz 45nm Core 2s vs. the 1.6GHz and 1.8GHz 65nm Core 2s from the original model). The move to 45nm should cut down power consumption and thermals a bit, and Apple didn't put a smaller battery in the new Air, so battery life should improve.

There's also a new, cheaper SSD option. For \$500, Apple will sell you a 128GB Samsung MLC SSD, much better than the \$1,000 64GB option that was available when the Air first started shipping. Because of the new drive, I can't really provide a good battery life comparison to the old Air, but I will say that in general the new Air with the SSD

manages to last around the same amount of time as the old Air with the old SSD. The new SSD is faster and presumably draws more power, so you could argue that the new Air does last a bit longer than the old one, but the difference isn't as big as I'd expect.

The move to a GeForce 9400M instead of the old Intel integrated graphics makes the UI performance of the new Air much improved, especially in heavy multitasking scenarios (which are now possible at

a lower cost thanks to the somewhat affordable SSD option). The \$500 SSD upgrade takes the \$1,799 model up to \$2,299, but if you're weighing your options I'd recommend the \$2,499 system, as it costs only \$200 more, and you do get a faster CPU, something that can be useful since there is a noticeable performance difference between the Air's CPU and the 2.4GHz parts you can get in a MacBook or MacBook Pro.

Interestingly, the most noticeable improvement to the new Air is how much cooler it runs. The bottom of the system still gets warm, but not as sweat-inducingly hot as the first-gen Air.

The MacBook Air is still expensive and is still something I'd only recommend for someone who does a lot of writing and not much else. Most users would find themselves more than satisfied with a regular MacBook, but if you happen to do a lot of moving about (whether around the house, town, country, or globe) and a lot of writing while you move, it's pretty much as good as it gets.

My original caveat regarding the Air (see the April 2008 issue) still applies, however: It is still a notebook with a very finite lifespan. There's no upgrading the 2GB of DDR3 that Apple ships on the machine by default, and at some point that amount of memory will no longer cut it. If Apple shipped the Air with 4GB, it'd be a much safer bet, but as it is you'll likely want to upgrade in another 1.5 years or so.

The MacBook Air is clearly a luxury item, but if you can appreciate its benefits, it may be worth the premium price. For most, I'd say it's probably not. ▲



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' "48 Hours," and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

The Shark Tank

by Alex "Sharky" Ross

Core i7 Rolls Out

Intel's Core 2 processors have enjoyed a dominant two-year run and absolutely slaughtered just about everything AMD has offered. We've had faster Core 2s and revamped Core 2s (Penryn), but by the time you read this, the Web and retail stores will hopefully be abuzz with all sorts of Intel Core i7 (previously code-named Nehalem) fanfare. After months of "Nehalem" speculation, rumors, and previews, Intel is finally taking off the lid on its next-generation microprocessor. The Core i7 and the newly announced X58 chipset actually represent the most significant platform change in the company's recent history.

For starters, Intel has done away with linking two dual-core dies in a single package (expensive and not exactly as efficient as AMD's approach) and the Core i7 sports a monolithic die harboring all four execution cores. Call it a "real" Quad-Core if you will, each with its own L1 (64K per core) and L2 (256K per core) caches. New this time around is a heavyweight powered 8MB L3 cache accessible by any of those four cores.

The core itself borrows much from the Penryn and is based upon Intel's proven 45nm high-k metal gate manufacturing process. With approximately 731 million transistors, Core i7 is packed neatly into a 263mm² area vs. two Penryns, each with 410 million transistors and 107mm² areas. Essentially, you're getting a more powerful core (along with enhanced features) in a cheaper-to-manufacture and more efficient package, so what's not to like? Core i7 debuts an improved Hyper-Threading engine (this time more energy/power efficient) thanks to a great number of load and store buffers. Also new to the table is Intel's SSE4.2 instructions set for improved 3D graphics and media performance.

The traditional northbridge-style memory controller is gone, too. How does an on-die, three-channel, DDR3 memory controller with up to three channels of DDR3 memory per socket sound? Sounds like more bandwidth and less latency at the same time. This on-die approach has its

advantages and opened the door for Intel to design a new serial interconnect, called QPI (Quick Path Interconnect), that sits between the CPU and chipset that dishes out 25.6GBps of bandwidth per port over 40 data lanes!

Core i7's new power management and Turbo modes have really tickled my fancy. Not only is leakage reduced, but within the i7 sits a miniprocessor serving as a power management unit. This

wee core is able to sample power, current, and voltage data from monitors internally to the main core to intelligently adjust and control power delivery. The Turbo mode takes the data received from this power control unit in another direction completely. If one particular core is being heavily overworked in comparison to another, turbo mode can literally tap in to those resources. It doesn't just stop at a single core; the entire CPU can actually be bumped up with a higher multiplier if desired. Turbo mode should be one that tweakers/overclockers will spend a good few hours on in the coming months.

Core i7 processors do require a new LGA 1366 socket motherboard, so set some pennies aside for a new X58 platform (about \$250 to \$300 for a tweakable and gamer-friendly one). Asus, Gigabyte, and obviously Intel have all announced motherboards, so availability and choice won't be a problem. Early performance already shows that even clock-for-clock the i7 is markedly faster than anything a Core 2 can muster for gaming, providing you pair it up with a beefy GPU. The first CPUs ready for release will be the 3.2GHz i7 965 Extreme, 2.93GHz i7 940, and 2.66GHz i7 920 Extreme (the real gem here) models ranging from \$999 down to \$285 in quantities of 1,000. To the end user who doesn't buy them in quantities of 1,000, that means about \$300 for a really peppy i7 920 Extreme. ▲



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/lab user, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he's not tweaking PCs.

Email me at sharky@cpumag.com

PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Arctic Cooling Freezer Xtreme

The Arctic Cooling Freezer Xtreme CPU Cooler (\$44.95; www.arctic-cooling.com) is all about high performance. This gargantuan cooler features four double-sided heatpipes and a dual-tower heatsink design with 102 cooling fins for dissipating massive amounts of heat. With its included 120mm PWM (pulse-width modulated) fan, the Freezer Xtreme has a maximum cooling capacity of 160 watts, which is more than enough for even an overclocked quad-core processor. The cooler's fan is mounted in a patented holder that helps minimize vibration and noise. In fact, Arctic Cooling claims the Freezer Xtreme outputs only .5 sones under full load, which is barely audible. The Freezer Xtreme is compatible with Intel LGA775 and AMD socket 939, 940, and AM2 processors. It ships with



The Arctic Cooling Freezer Xtreme operates in near silence and is compatible with both Intel and AMD processors.

high-quality MX-2 thermal paste preapplied and carries a six-year warranty.

Antec Skeleton

Once in a while, a new product arrives that almost completely deviates from the norm. Take Antec's Skeleton, for example. Although it's difficult to classify the Antec Skeleton (\$159.99; www.newegg.com) as a case, we couldn't call it anything else. But it features a unique, open-air design that puts all of the system's innards on display.

The Skeleton is compatible with ATX, MicroATX, and MiniITX motherboards and features two external 5.25-inch drive bays and two internal 3.5-inch bays. An optional side-mounted drive tray, which holds up to four 3.5-inch drives, is also available. To aid in cooling, the Skeleton has a top-mounted, 250mm, 3-speed fan, which also has multicolor LEDs for personal customization; a front-mounted additional 92mm fan is mounted at the front to keep hard drives cool.

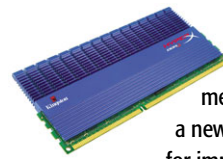
The Skeleton also sports an array of front-panel connectors, which include two USB ports, a FireWire port, an eSATA port, and headphone and microphone jacks. It might hold PC components, but the Antec Skeleton is nothing like a traditional case.



The Antec Skeleton's open-air, unique design is sure to turn some heads.

Kingston HyperX T1 Series

Kingston has offered HyperX memory modules targeted at the enthusiast community for years, but the company has never strayed from its flat heat spreader design until now. Kingston's new HyperX T1 modules (\$54 to \$317; www.kingston.com) are outfitted with thicker, taller heat spreaders that are better able to diffuse heat that builds up within the modules. The new HyperX T1 Series heat spreaders are made of heavy-duty aluminum, with fins that extend about an inch from the edge of the modules' PCB. Dual-channel DDR2



Kingston Technology's new HyperX T1 memory modules feature a new, taller heatsink design for improved heat dissipation over previous HyperX modules.

kits are available in 2GB and 4GB capacities, while DDR3 kits are available in 2GB and 3GB in dual- or triple-channel configurations. All of the HyperX T1 kits have a lifetime warranty.

Fashionably Fresh Firmware

Popcorn Hour A-110 (v01-17-081023-15-POP-403)

A recent firmware update for the Popcorn Hour A-110 media extender fixes a myriad of issues related to video and audio playback with numerous file types, and enhances performance of MKV (Matroska video) HTTP media streaming.

www.popcornhour.com

Lite-On iHAP322 (vU15)

The latest firmware update for the Lite-On iHAP322 DVD burner enhances the drive's compatibility and performance with more media types.

www.liteonit.com

OLPC XO (vq2e21)

A firmware update for the OLPC (One Laptop Per Child) XO-1 resolves an issue with Emacs leaving cruft at the end of files and a bug which caused scan-nand to misclassify erased-without-cleanmarkers blocks.

wiki.laptop.org/go/Home

by Marco Chiappetta



SILENT PRO Series

Indulge your self in silence and performance with Cooler Master's new power supply series: Silent Pro.

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When A GeForce Isn't A GeForce

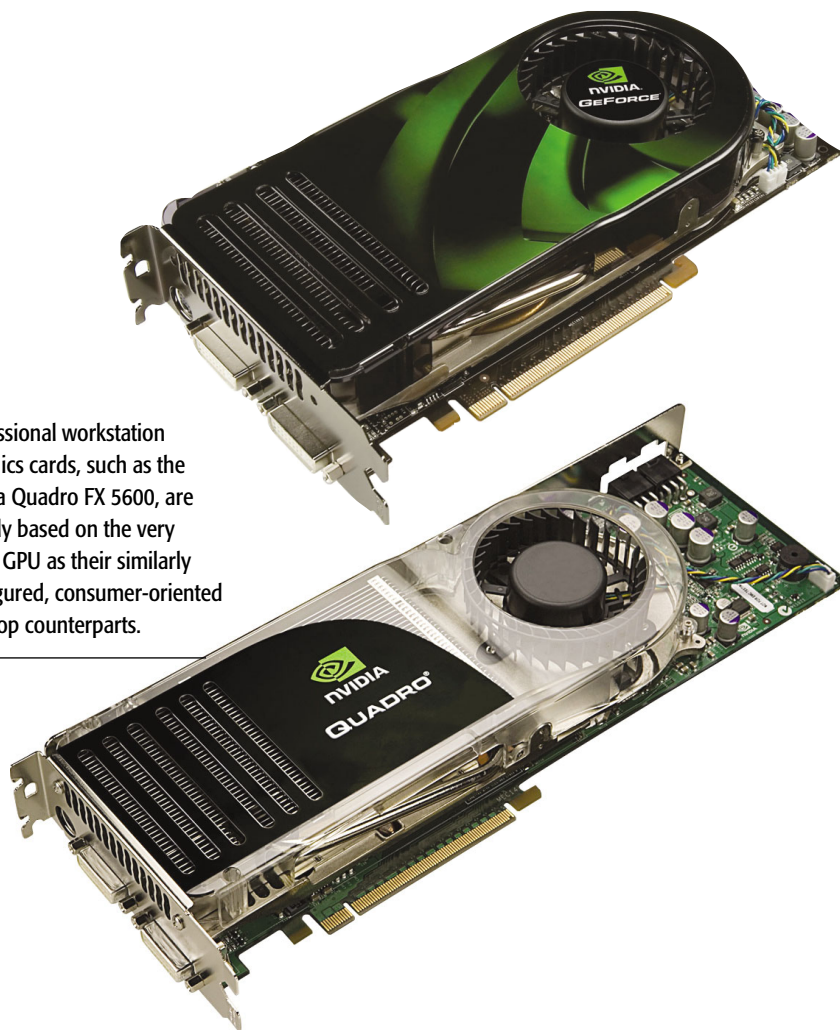
GeForce 8800 GTS-To-Quadro FX 5600 Soft Mod

Over the years, the vast majority of mods featured here have catered to hardcore PC enthusiasts or overclockers. That's not a problem in and of itself—we're dedicated to power users after all—but that inadvertently neglects another important group just as hungry for extreme performance, professional workstation users.

If you step back and think about it, the pro workstation crowd may be worse off than any other in this hobby of ours. Consider for a moment how expensive some of the hardware and components targeted at the professional market can be. Compare the price of a similarly clocked Xeon to a Core 2, or a Quadro FX to a GeForce, for example, and you'll know exactly what we mean. Although we enthusiasts may cringe at the \$550 price tags of newly released flagship graphics cards and \$1,000 Extreme Edition processors, try paying \$3,500 for a cutting-edge workstation-class graphics card or \$2,500 for a 2.4GHz, 6-core Xeon E7450, not to mention the ultra-expensive motherboards and RAM necessary to use them. The costs associated with remaining on the cutting edge in the professional workstation arena are truly staggering.

There are a few reasons why workstation-class hardware is more expensive than its desktop equivalent. For one, workstation-class hardware goes through more rigorous testing and qualification to ensure stability and compatibility with a wider range of components and software. This is why a Quadro can hardware-accelerate certain professional content-creation applications, while Nvidia's desktop counterparts do not. Workstation-class hardware usually has special features

Professional workstation graphics cards, such as the Nvidia Quadro FX 5600, are usually based on the very same GPU as their similarly configured, consumer-oriented desktop counterparts.



designed for more specific usage scenarios, as well, such as genlock/frameclock compatibility or extremely large frame buffers, and the target market is much smaller. All of these things add up to a significantly higher price tag.

Thankfully, there are some mods out there that can save professional workstation users some serious coin, if they're willing to forgo a few features and take a

chance modding equivalent consumer-level hardware. Take the G80-based GeForce 8800 series, for example. The G80 GPU used on those cards is also used to power a few members of the more expensive Quadro FX line. But if they're based on the exact same GPU, why can one card do some things the other can't? The short answer is that Nvidia's drivers don't allow it to. With a little software

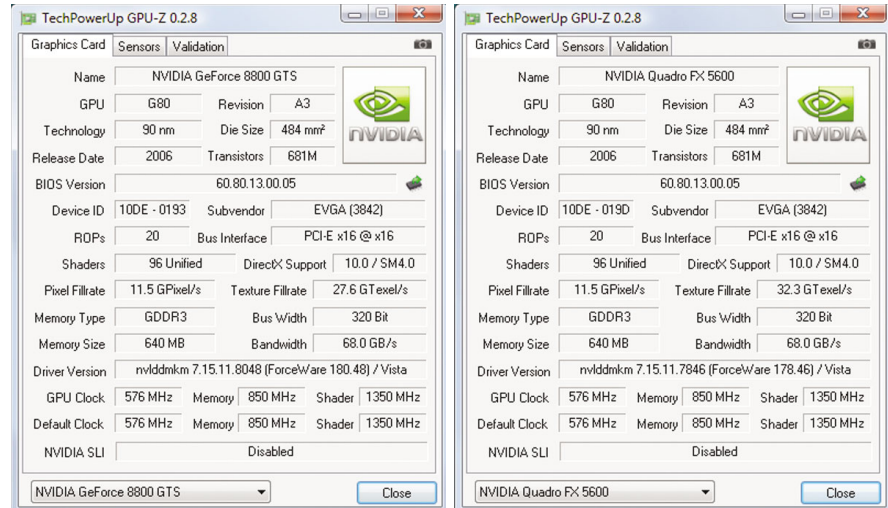
trickery, however, it's possible to fool an OS into thinking a G80-based GeForce 8800 is actually a Quadro FX. Here's how you do it.

Get Organized

Before you begin, there are some files and information you'll need to acquire. First, grab a copy of GPU-Z (www.techpowerup.com/gpuz). It'll let you identify exactly which GPU revision is used and which Device ID is assigned to your particular graphics card. This information is important to note because it is not only G80-based cards that can be soft-modded in the manner we'll explain later: Many older GeForce cards can be modded into equivalent Quados, as well. Second, download a copy of RivaTuner (www.guru3d.com/category/rivatuner). RivaTuner is the application that actually makes this particular mod possible. And finally, download the latest drivers available for the Quadro card that's equivalent to your GeForce.

According to GPU-Z, the GeForce 8800 GTS 640MB card we used for this mod had a G80 GPU and a Device ID of 10DE-0193. It's the last few digits of the Device ID and the GPU type that are important to note. With this information in hand, you can find out which, if any, Quadro your card can be soft-modded into.

To find out if your GeForce has a Quadro equivalent, you'll need to use Notepad (or any other text editor) to open the `nv_disp.inf` file included in the Nvidia Quadro driver package and scroll down to the bottom of the text. There, you'll see a block of text in a group labeled "Localizable Strings" that lists all of the graphics cards supported by the driver. The line that was important to us read "NVIDIA_G80.DEV_019D.1 = 'NVIDIA Quadro FX 5600.'" That line tells us that an Nvidia G80-based graphics card with a Device ID of 019D.1 equals a Quadro FX 5600. Don't mind



The last few digits of the graphics card's Device ID, as reported by GPU-Z, hint to the fact that it can be soft-modded into a workstation-class Quadro FX.

the "D.1" in the Device ID there, however, as it's the "019" that is important.

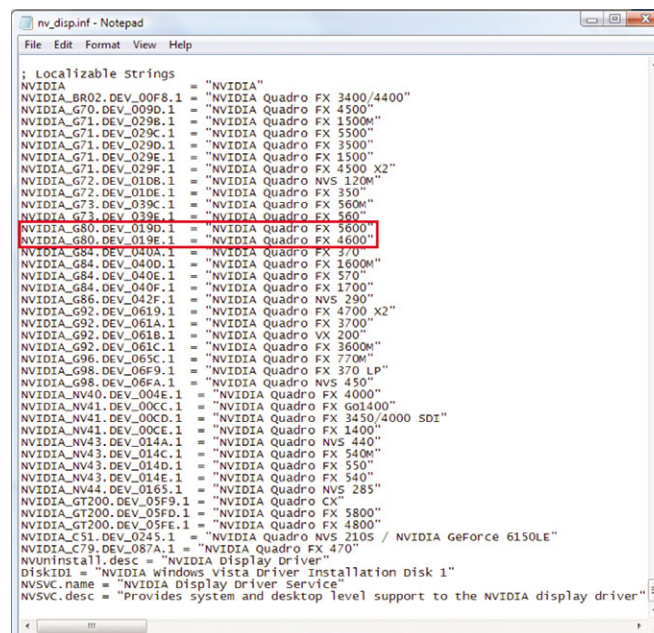
GeForce 8800 GTS, Quadro-ized!

The actual GeForce-to-Quadro soft mod requires two steps. First, RivaTuner is used to soft-mod the GeForce into a Quadro, and then after a reboot, the necessary Quadro drivers need to be installed. To begin, install RivaTuner. Once the

installation is complete, launch the program and wait for it to become usable. (RivaTuner typically backs up important parts of the Windows Registry that the program can modify when it is initially launched.) This process can take up to a couple minutes.

Once RivaTuner opens, highlight the Main tab; you'll see a couple of sections for the Target Adapter and Driver Settings. In the Target Adapter section at the top, click the arrow-shaped icon next to the Customize label, which is just below the graphics card listing. A small menu with a few icons will pop out. On the Customize menu, click the first button, which has a picture of a graphics card on it. If you hover your mouse cursor over the button, it will be labeled "Low-Level System Settings."

After clicking the button, a new window will open labeled "Low-Level System Tweaks." Click the NVStrap Driver tab at the top. We should note that if the NVStrap tab is not available here, your GeForce is based on a newer GPU that is either not supported by RivaTuner or cannot be



Scroll to the bottom of the text contained in the `nv_disp.inf` file included with every Nvidia driver release and you'll find the "Localizable Strings" section where the GPU used and Device ID assigned to each graphics card is listed.

soft-modded into a Quadro. The NVStrap Driver window is broken up into the following three sections: NVStrap AGP Settings, PCI Device ID Settings, and Graphics Processor Configuration. In the middle section labeled “PCI Device ID Settings,” click the drop-down menu at the upper right labeled “Graphics Adapter Identification” and select Custom. Once you’ve selected Custom, you’ll be able to scroll through a list of options in the field below. Click through the list and select the appropriate Quadro option for your GeForce; in our case it was a Quadro FX 5600. Click Apply and OK, and RivaTuner will prompt you to restart the system. Click Yes and let the system restart. At this point, RivaTuner will have essentially tricked the OS into detecting the GeForce as its Quadro equivalent.

When the system restarts, the New Hardware Detected Wizard will launch. Cancel the wizard and install the Nvidia Quadro drive package you downloaded earlier. Once the drivers are installed, you’ll have to reboot one more time. If all goes to plan, Windows will detect your card as a fully functional Quadro.

Did It Take?

To see if the GeForce-to-Quadro soft mod worked, simply go to Device Manager and check the installed display adapter. In our system, the card that was originally detected as GeForce 8800 GTS showed up as a Quadro FX 5600. If your card is detected as a Quadro, as well, run a few OpenGL workstation benchmarks or work in your favorite 3D modeling application to see if you can perceive any performance gains.

With soft mods of this type, however, there’s no guarantee that every single application certified to work properly with the actual workstation-class hardware will operate normally on a modded component. The worst-case scenario is that the application doesn’t benefit at all. But in the best-case scenario, the application will see a significant performance increase. ▲

by Marco Chiappetta

There & Back Again: Quadro To GeForce

If you have performed this GeForce-to-Quadro soft mod and would like to revert your card back to its original state, a few additional steps are necessary. Simply trying to install GeForce drivers won’t work, because the operating system will still be detecting the card as a Quadro. You’ll essentially have to perform the mod in reverse order.

First, uninstall the Quadro drivers via Add/Remove Programs in Control Panel. Once the drivers are removed, restart the system. When Windows restarts, the New Hardware Detected Wizard will launch. Cancel the wizard and run RivaTuner. Then in the Target Adapter section, click the arrow-shaped icon next to Customize. In the Customize menu, click the first button to open the Low-Level System Tweaks window. Once there, click the NVStrap Driver tab at the top and in the PCI Device ID Settings section, click the drop-down menu at the upper right labeled “Graphics Adapter Identification” and select “Determined By Hardware” from the menu. Once you’ve selected this option, click Apply and then click OK, and RivaTuner will prompt you to restart the system. Click Yes, let the system restart, and when Windows reboots, install the drivers necessary for your GeForce, and your system should be back to its original state.

Performance: Before & After The Mod

Taking the time to soft-mod a GeForce into a Quadro doesn’t make much sense if there is nothing to gain. So, to illustrate what kind of effect soft-modding our GeForce 8800 GTS 640MB into a pseudo-GeForce FX 5600 had on its performance, we ran all of the viewsets built into the SPECviewperf v9.0.3 OpenGL benchmark. We conducted our tests on a 3.2GHz Core 2 Extreme QX9770-powered system built around an Asus X48 Express-based motherboard, which was equipped with 4GB of RAM and a Western Digital Raptor hard drive. The operating system was Windows Vista Ultimate SP1 32-bit. We used Nvidia’s GeForce v180.48 drivers with the card when it was operating as a GeForce 8800 GTS and the Quadro v178.46 drivers after the soft mod.

The results from the SPECviewperf benchmark were interesting to say the least. Soft-modding the GeForce into a Quadro resulted in performance increases ranging from negligible to extreme and even allowed one test that failed to run on the GeForce (proe-04 [Pro/ENGINEER]) to operate properly after we modded the card into a Quadro. We saw the largest performance gain (more than 70%) in the sw-01 (Solidworks) viewset, followed by the CATIA-02 viewset, which saw an increase of just over 10%. The rest of the results were within a couple of percentage points.

SPECviewperf v9.0.3

	GeForce 8800 GTS 640MB (Unmodded)	Quadro FX 5600 (Soft-Modded 8800 GTS)	Percent Improvement
3dsmax-04	9.23	9.403	1.87%
catia-02	10.77	11.88	10.31%
ensight-03	15.9	15.93	0.19%
light-08	8.876	9.124	2.79%
maya-02	25.92	27.83	7.37%
proe-04	N/A	9.032	N/A
sw-01	10.04	17.13	70.62%
tcvis-01	3.175	3.178	0.09%
ugnx-01	4.767	4.903	2.85%



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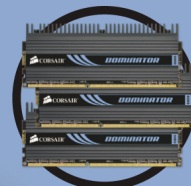
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Mad Reader *MOD*

MendoPlex13

Heavy-duty watercooling setups require a lot of room, and most cases can barely house even a modest watercooling kit. So, what was modder David Mendicino to do when he decided to incorporate not one, but two hefty radiators into his design? Build a new case, of course. Thus the MendoPlex13 was born, and at 13 inches wide, David had no problems fitting in all the hardware he wanted to keep his system cool.

David has been a modder for several years. Like most modders, he started out with simple cutting mods and painted cases. He became interested in more complex mods after seeing designs by top-notch modders. His first big mod was the MendoPlex (see the February 2005 issue of CPU), which was an entirely custom-built case inspired by the completely clear PC cases that first started appearing several years ago. The MendoPlex13 also has its roots in the clear case design and is made mostly from Plexiglas, but as you can see, David added some metal framing (as well as a whole lot of fans and other hardware) to give the case a bit of a different look. It took David about a month and a half to create the MendoPlex13, working in his office in his spare time, and using nothing more than a drill, rotary tool, and handsaws.

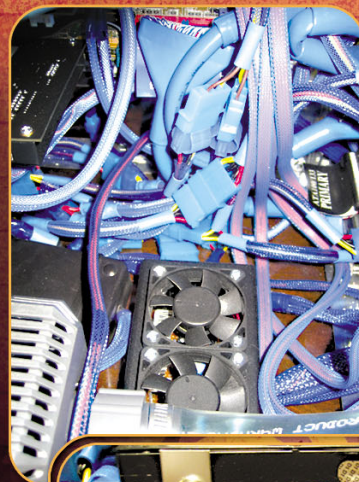
David settled on the size of the MendoPlex13 by calculating how much room he'd need to squeeze in a pair of Swiftech MCR320 radiators side-by-side, and he figured 13 inches would be about right. David also wanted to include several other features in the case that added to its functionality. For example, the side panels are hinged so he can easily access the PC's components, and the motherboard tray is removable. Dave also custom built two hard drive cages to house his collection of seven hard drives. He mounted the radiators with foam lining and Velcro so they could be removed without hassle for maintenance and cleaning. Each radiator supports three 120mm fans, and David built a fan controller to control them. Of courses, a clear case like this is begging for good lighting, so David modified several LED fans. The light in the fans won't dim if the fans are turned down. And, as you can see, Dave also added cold cathode lighting, and all the cables in the PC are sleeved. About the only parts in this case that David didn't create himself are the motherboard tray and the optical drive cage.

There's a whole lot of hardware in this PC. David used an Asus P5AD2E-Deluxe motherboard paired with a Pentium 4 530J 3GHz CPU overclocked to 4GHz, and 2GB of OCZ DDR2 RAM. He chose an XFX GeForce 8600 GTS video card and a SoundBlaster X-Fi Titanium Professional for audio. David powers this rig with an Enermax EG465P-VE(FC) PSU. As for storage, David has plenty of it in the form of seven Western Digital hard drives (one 80GB, one 100GB, one 120GB, and four 250GB). The cooling system includes a total of eight 120mm fans, a 92mm fan, an OCZ XTC Ram Cooler, an Eheim 1250 water pump, the aforementioned Swiftech radiators, a Swiftech MCW6002 CPU block, a Swiftech MCW60-R2 GPU block, and a Swiftech MCRES-Micro reservoir. David used MasterKleer 3/4-inch OD/1/2-inch ID tubing. No wonder he needed such a large case. ▲

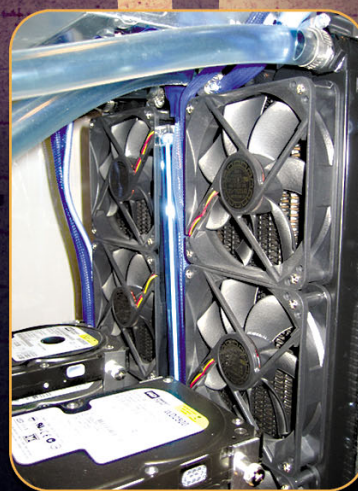


When your custom-made case includes as many fans as the MendoPlex13 does, you need a few switches and a fan controller to manage them.

The case may be clear, but there's a lot of blue to be found inside. All the cables are sleeved, and all the wires sport blue connectors.



David made almost everything in the case by hand, including the hard drive cages. David made two cages that each can hold up to four hard drives.



David's watercooling system includes two radiators, cooled by 120mm fans.

A clear case such as the MondoPlex13 is begging to be lit up. David outfitted his PC with blue cold-cathode lights and LED fans.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreaderm@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with \$1,500 and a one-year subscription to *CPU*.

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“ You would think
the design and
build process
could have been
optimized enough
at this point that
this sort of
technology could
become reality. ”

Each month we dig deep into the mailbag here at CPU in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable? CPU's "Advanced Q&A Corner" is here for you.

Paul F. asked: I have a confusing problem that I was hoping you could help me with. Bear with me for a minute while I explain the situation. I'm not terribly tech-savvy, but I managed to set up a wireless and wired network in my home that my wife, kids, and I all use. Later I added a Western Digital network-attached drive so that we could all share files more easily. More recently though, I bought an inexpensive logear networked DVI extender, thinking that I could watch media stored on the Western Digital drive on my TV. For the most part everything works, but whenever I have to reset my router (which I unfortunately have to do often because my DSL connection is horrible), the Western Digital drive gets a different IP address, and I have to completely resetup the logear box. Is there something I could do to make sure the Western Digital drive always has the same IP address on my network?

ADD DHCP RESERVATION

Enable: ☒

Computer Name: << Computer Name ▾

IP Address:

MAC Address:

DHCP RESERVATIONS LIST

Enable	Computer Name	MAC Address	IP Address	
☒	N4100PRO	00:14:fd:10:b5:60	192.168.0.199	 

NUMBER OF DYNAMIC DHCP CLIENTS:6

Hardware Address	Assigned IP	Hostname	Expires	
00:07:40:a4:fc:01	192.168.0.109		13 Hours 22 Minutes	Revoke Reserve
00:18:de:28:a4:dc	192.168.0.194	Pinky	6 Hours 1 Minutes	Revoke Reserve
00:18:de:02:58:c0	192.168.0.196	lamborghini	16 Hours 4 Minutes	Revoke Reserve
00:00:00:00:00:00	192.168.0.197		Never	Revoke Reserve
00:11:32:01:61:ed	192.168.0.198		13 Hours 22 Minutes	Revoke Reserve
00:14:fd:10:b5:60	192.168.0.199	N4100PRO	Never	

IP addresses can be reserved for specific devices on a home network using DHCP if the DHCP server, which is usually a broadband router, has the option built-in, such as the D-Link model shown here.

A: Although you left out a crucial piece of information, Paul—the model number and brand of your router—we should still be

able to help you out. What's happening here is that your router is configured to use DHCP (Dynamic Host Configuration Protocol) to assign IP addresses to the devices connected to your home network. DHCP virtually eliminates the need for manual configuration, but if certain parameters aren't set, you can run in to a situation like yours where network attached devices end up with different IP addresses when the DHCP server (which in this case is your router) is reset.

To resolve your problem, you can do one of two things. The first and more difficult option is to set all of your IP addresses manually and configure your router for operation with static IPs. That's a pain, though, and it makes it more difficult for friends to get on your network if they bring a notebook or other PC over for whatever reason. A better solution, in our opinion, is to reserve an IP address for the Western Digital drive so that it's assigned the same IP address whenever the DHCP server is reset, assuming your router has the ability.

If you have a decent, fairly new router from a respected brand such as Linksys (Cisco), Netgear, Belkin, or D-Link, it will likely have the option built-in to create a DHCP reservation list. If it doesn't, make sure you're using the latest firmware, as the option may have been added after the router's original release. Log in to your router by opening up a browser window and entering its IP address (usually 192.168.0.1, 192.168.1.1, or 192.168.0.100) and then entering the necessary credentials. If you never changed your router's login information and don't know the name and password, refer to your user's manual for the default credentials. Once logged in, navigate to the setup menu and then the advanced network setup—it may be called something else, depending on the brand of your router. On that menu you should see the option for DHCP reservations, along with a list of the devices connected to your network. Select your Western Digital drive, add it to the reservation list, pick the IP address you want, and you should be all set.

Chad W. asked: I've been looking at some of the reviews on the Web recently for all the new small netbooks that are coming to market. What always leaves me baffled is why they can't put one together that at least has some level of gaming capability. Now, I wouldn't expect these little machines to fire up and play Crysis at 1,920 x 1,200 resolution, especially since they only have tiny 10-inch or smaller screens. However, at a native resolution of 1,024 x 640 or so, you would think they could at least build one with some sort of 3D graphics capability. Granted battery life could be a bit hampered, but with all the power savings and deep sleep modes of current GPUs and CPUs, the system could easily be ramped down when not being stressed under a gaming condition. I, for one, would be willing to pay a little bit more for a small netbook that I can take anywhere that would be able to do some light gaming. I'd also have no problem with needing to plug it into a wall socket for a gaming session, just so I don't run the battery down too quickly. When will we see these types of machines, with just a little more capability, hit the market? Or is there just not enough market potential for them? It would seem to me that small doesn't have to equate with completely emaciated processing power.

A: We feel your pain, Chad, as we've oftentimes wished that some of the major OEMs or even a boutique manufacturer could break out with something innovative like what you described. You would think the design and build process could have been optimized enough at this point that this sort of technology could become reality. Unfortunately, the laws of physics simply get in the way. Thermal management becomes a huge challenge when dealing with bleeding-edge designs like this, with powerful processors under the tight mechanical constraints of a 10-inch or even 12-inch netbook form factor. However, very recently one manufacturer has actually broken the mold, so to speak.



Asus' N10Jc netbook is built on a standard Intel Atom reference design but also incorporates switchable discrete Nvidia GeForce 9300M graphics.

Asus has released a 10-inch netbook called the N10Jc and, as the company claims, this is what it's calling its first "corporate" netbook. Frankly, we're a little lost on that branding as we think it would be more aptly named the first "performance netbook." The Asus N10Jc is built on a standard Intel Atom N270 reference design, for ultra-low power consumption, save for one key strategic architectural enhancement. In addition to its 1GB of DDR2 system memory and standard 2.5-inch notebook hard drive, the N10 also sports a Nvidia GeForce 9300M graphics chip under its hood. Fortunately, the graphics subsystem is also switchable. As a result, when you don't need the pixel shading power of the GPU, you can switch it off and rely on the integrated graphics core of its Intel 965 chipset. When you engage the system's discrete graphics engine, you can get by pretty decently at the N10's native 1,024 x 600 screen resolution in a few of the lighter-duty game engines.

Stacy V. asked: I'm hearing a lot about Intel's new Core i7 processor, and while I'm always excited about new technology, I'm not all that thrilled with what I've learned so far about the chip. It's still 45-nanometer technology, and instead of having a nice big L2 cache, it now has a much smaller 512KB L2 per core and a large pool

of shared L3 cache. As far as I know, L3 is a slower, higher-latency cache, so this chip is hampered right out of the gate with that, right? Also, clock speeds are starting out at 3.2GHz, and we already have a 3.2GHz Core 2 QX9770. So where's all the new-found performance that Intel is claiming going to come from? How can this thing be faster with a higher-latency cache and the same clock speed? Were there at least some additional power-savings features designed in? I've seen some of the benchmarks out there and the numbers look promising but I wonder if they equate to the real-world performance, when you consider on paper how almost run-of-the-mill this new Intel processor seems to be. What gives?

A: Stacy, quite frankly, we couldn't disagree more with your assessment of Intel's new Core i7 processor and its associated platform architecture. In fact there are more ground-breaking innovations on this new Intel desktop CPU (at least for Intel) than have been introduced in the last several new Intel processor architectures introductions. The most significant architectural update would be Intel's new QPI (Quick Path Interconnect) interface that now replaces the Core 2's aging shared frontside bus architecture.

This 40 lane bi-directional serial interface provides more than 25GBps of available bandwidth, several times more than Intel's old bus architecture. In addition, the Core i7 now incorporates a DDR3 memory controller on-chip, where historically it resided in the chipset of the motherboard. This new level of integration of the memory controller allows for a significant reduction in latency. Also, it's a triple-channel architecture that offers over three times the memory bandwidth vs. Intel's previous generation double channel discrete memory controller design. With all of these new architectural enhancements, Intel's new Core i7 actually ends up being up to 25% faster clock-for-clock, especially in heavily multithreaded usage models. So, in short, there's a lot of new technology under the hood of Intel's new chip that goes far beyond just cache and clock speeds.

Charles T. asked: For the last few weeks, whenever I turn on my system I hear a really loud grinding noise that eventually goes away after the system "warms up". I checked my hard drive and graphics card, and they seem to be fine, so I assume it's my power supply that's having a problem. I say assume because I don't know of a way to specifically test it outside of my system, but the noise seems to be coming directly from the PSU if I put my ear up to it, so I'm pretty sure it's going bad. Do you think I should replace the whole thing, or could it just be the cooling fan going bad? If it is just the fan, is that something that can be replaced easily? I was told I should never open up a power supply because they hold a charge and could kill me. Is that true?

A: Actually, yes, it is true that the capacitors in a power supply can hold enough of a charge to kill someone, which is why some people say they shouldn't be opened up and worked on. But if you take some precautions and be careful, you shouldn't have to worry. Before you do anything though—and we know

this is going to sound a little nuts—sniff your PSU to check if its putting out an acrid odor, kind of like the smell of burning hair. If not, it's probably just the cooling fan that needs replacing. If you do smell something funky though, replace the whole PSU.

Should it turn out that you simply need to replace the fan, unplug your PSU and let it sit disconnected from everything for as long as possible to give the capacitors some time to discharge—a full day would be best, but even then the caps can still be holding a charge, so you'll have to be careful. When you open up the PSU, be extremely careful not to touch any of the solder connections on its internal PCB so you won't get shocked; we'd also recommend wearing some rubber gloves if you want to be extra cautious.

With the power supply opened up, it should just be a matter of unscrewing the PSU fan and replacing it with one of a similar size. The worst-case scenario is you'll have to cut the fan's leads because they're soldered to the power supply's PCB and connect the new fan's leads directly to the old one, but that's fairly painless. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com



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 **TRENDnet®**

ICT's Multicore "Dragon" CPUs

Intel's Pentium and Core 2 and AMD's Athlon microprocessors are well-known, worldwide brand names. China's Loongson microprocessor brand name, however? Definitely not as well-known, especially in the United States.

But, at least in its home country, Loongson might be on its way to becoming more famous than the others.

As part of a project sponsored by the Chinese government over the past decade, Chinese researchers announced plans to release a quad-core Loongson microprocessor this year. Loongson is still a long way away from competing technologically with Intel and AMD processors, but the Chinese CPU's emergence may significantly limit the future influence and use of Intel and AMD chips in China.

The Chinese Academy of Sciences' ICT (Institute of Computing Technology) has a few hundred researchers, engineers, and designers working on the project, which is creating chips brand-named Loongson ("dragon chip"). The Loongson project has a goal of achieving "CPU independence" for China, meaning creating inexpensive, usable CPUs in enough quantities to allow

most middle-class Chinese citizens to afford personal computers by 2010, without having to rely on imported chips. The chips will appear in workstations and computers aimed at school children, too. Some Loongson chips already are in servers and PCs in use in China.

"It probably doesn't affect people in the United States right now," says Tom R. Halfhill, a senior analyst for In-Stat's Microprocessor Report, about ICT's announcement regarding Loongson. "A few of these might be exported in products, but they're mostly for Chinese domestic production."

"It's kind of the same way the United States wants to achieve energy independence. It makes sense for them."

Inside The Dragon

ICT announced its first Loongson chip in 2001, and the project has made steady technological improvements in its chips during the ensuing years.

"As far as the technology inside the chips, they are moving fast, faster than American designers did, but they also have a path to follow" from previous American

designers, says Halfhill, who has analyzed the Loongson project for several years.

A European company, STMicroelectronics, manufactures the chips using fabs in China. STMicroelectronics and ICT began working together in 2004. ICT designs the processors, and STMicroelectronics handles manufacturing and sales.

Rather than using x86 architecture, the Loongson processors make use of a 64-bit architecture that's compatible with MIPS64 from MIPS Technology. STMicroelectronics holds a full license for the MIPS64 architecture for the Loongson processors. MIPS Technology has been licensing its CPU architectures to third parties since the early 1990s.

At the Hot Chips conference in late August 2008 in Palo Alto, Calif., ICT announced details of its latest CPU, code-named the Godson-3. The four-core Godson-3 (projected for a release this year) will make use of 65-nanometer manufacturing. Eventually, Godson-3 should feature an eight-core version. The chip will incorporate power-saving features that allow the chip to shut down

Inside The Latest Dragon Chip

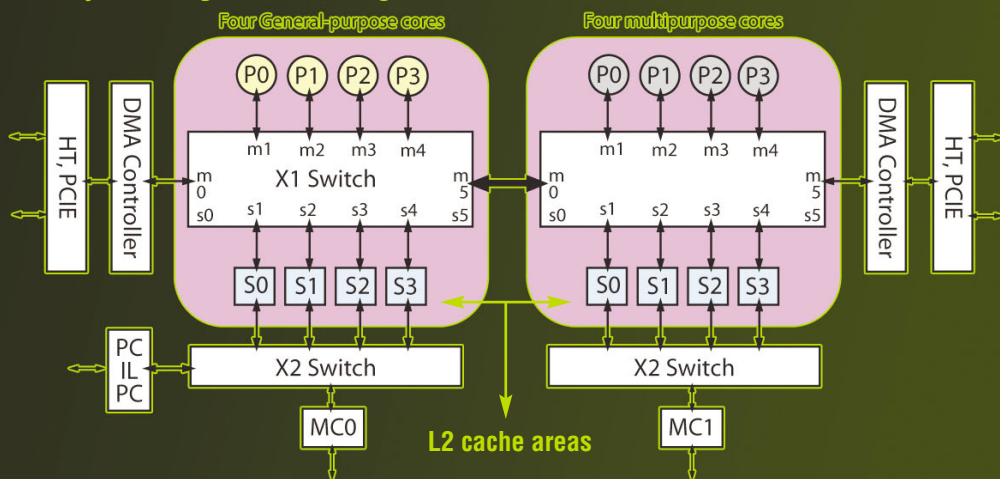
At the Hot Chips conference, ICT outlined some of the projected features of the design of the Godson-3 chip. ICT didn't provide a lot of

specific numbers about the new CPU, but it will feature four cores with four L2 cache blocks. An eight-by-eight crossbar switch handles traffic between the cores and the cache blocks.

With the first quad-core design, Godson-3 will make use of general-purpose cores (called GS464). In the future, with the eight-core design, ICT expects to introduce multipurpose cores (called GStera). The multipurpose cores will include a 128-bit AXI

(advanced extensible interface), and will work well for processing tasks that require high-end FLOPS, such as scientific calculations.

Projected Eight-Core Design



cores not in use for particular tasks. Loongson runs Chinese versions of Linux and other open-source software.

Engineers included an additional 200-plus lines of code with Godson-3, allowing it to simulate the Intel x86 architecture. With the x86 simulation, Godson-3 will be able to run some Windows software. (By only simulating x86, ICT believes Godson-3 doesn't require a license from Intel.)

As with other chips that simulate x86 compatibility, the Godson-3 will run the x86 software more slowly than native x86 chips. However, because the simulation is built into the chip's coding, Godson-3 should run the x86 software much more quickly than other simulation options, such as x86 emulation software, for example. At the Hot Chips conference, ICT officials said the x86 simulation operated at about 50% of the efficiency of native MIPS performance; the officials hope to reach 80% before manufacturing begins.

MIPS Architecture

Although Loongson chips are licensed for MIPS64, Loongson chips are not exact duplicates of MIPS Technology chips, Halfhill says.

"They're not cloning what MIPS has been doing," Halfhill says. "They're not copying MIPS' design. They're not

stealing the design work; they're making it compatible."

In addition to computers, MIPS architecture appears in many chips used in embedded systems. Products such as TiVo boxes and some gaming consoles use MIPS architecture chips. MIPS chips typically use less power than x86 chips, making them work well in embedded devices.

Low power consumption is a benefit of Loongson chips, too. For example, ICT has announced that it expects Godson-3's four-core design to use 10 watts of power and the eight-core design to use 20 watts, both of which are less than the power requirements of four- and eight-core Intel or AMD chips.

Competing Worldwide

Although it might seem strange for ICT to make announcements at a conference in the United States for a CPU that it has no plans to sell in America, Halfhill says Hot Chips was actually the perfect place for ICT to showcase its technological improvements.

"Hot Chips has been going for 20 years and is a well-known conference," Halfhill says. "It's a place to show off technologies. ICT is saying, 'Here's what we did. It's real.' It's a way of showing that they're interested in competing with the rest of the world in microprocessors."

Just don't expect the quad-core Loongson to compete directly with Intel and AMD's latest processors. With its MIPS64-compatible architecture and its 65nm manufacturing process, Godson-3 is well behind the technological advances of CPUs from Intel and AMD, and it likely won't offer transistor counts or overall power anywhere close to what Intel and AMD are offering with their current families of chips.

"I don't see that happening any time soon," Halfhill says of the possibility of Loongson chips threatening Intel or AMD chips. "It's not going to be as fast as an x86 processor. . . . Right now, it's about 40% as fast. It's not going to compete performance-wise with an Intel or AMD processor.

"They have some good fabs in China, good designers, and good examples to follow," Halfhill says. "At this stage, [ICT designers] are more interested in satisfying their own domestic market, where the needs aren't necessarily the same as in the export market. They're trying to make cheap PCs for home, for schools, etc. They're trying to make them affordable. . . . They're charged by their government to make inexpensive processors." ▲

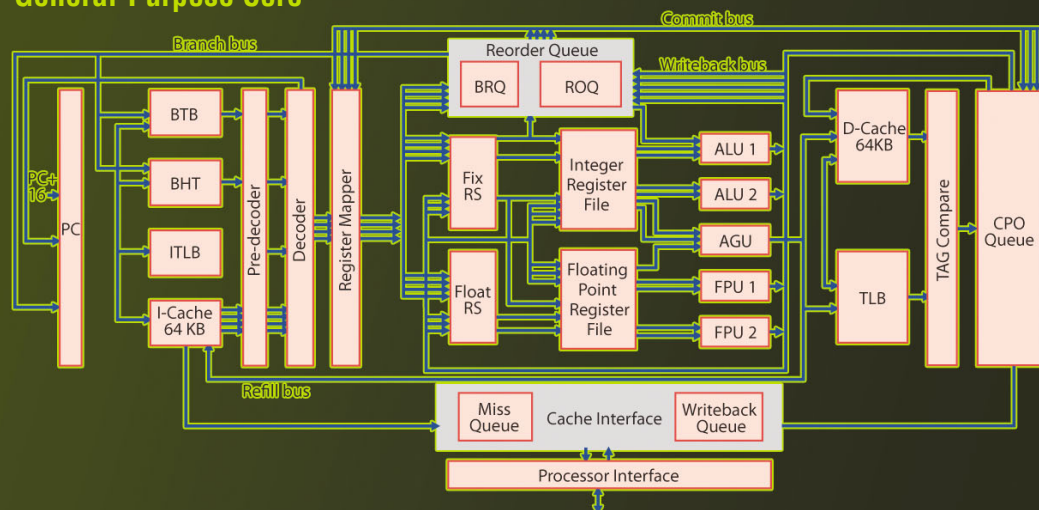
by Kyle Schurman

Within its general-purpose core, the Godson-3 features:

- A four-issue superscalar OOO (out-of-order) pipeline (four instructions per clock cycle)
- Two integer units (ALU 1 and ALU 2)
- Two floating-point units (FPU 1 and FPU 2)
- One load/store unit (AGU)
- 64KB L1 I-cache (instruction cache)
- 64KB L1 D-cache (data cache)
- 64-entry TLB (translation look-aside buffer)
- 16-entry ITLB (instruction translation look-aside buffer)
- 16-entry BTB (branch target buffer)

- 4K entry BHT (branch history table)
- 200-plus additional instructions, allowing for x86 binary translation
- 128-bit memory access ▲

General-Purpose Core



50-Plus Megapixel Digital Cameras For Pros

If your tech wish list includes a digital camera, and you are the kind of person who needs the latest and greatest features, you're in luck. Several companies recently announced new sensors and digital cameras that surpass 50 megapixels in resolution.

The bad news?

Unless the spending limit in your technology budget is around \$40,000, you'll probably have to settle for a digital camera with a much smaller resolution.

Obviously, with that price tag, manufacturers have aimed the new generation of digital cameras with 50MP and higher resolutions at professional photographers who need to create huge prints with near-perfect detail. Kodak says its 50MP sensor could provide enough detail in an aerial photo covering 1.5 square miles of a field

to detect an object measuring one square foot (about the size of a laptop computer).

For the rest of us, we'll have to be content with consumer-level and digital SLR (D-SLR) models with maybe around one-fifth as much resolution—and a much lower price tag—and wait for the trickle-down effect found in almost all types of technologies. Not a bad tradeoff.

Medium-Format Cameras

Achieving 50MP and higher resolution numbers requires a type of camera called a medium-format camera. Before digital photography, the term **medium-format cameras** referred to cameras that used film wider than 35mm film.

When using a medium-format camera for digital photography, you typically have a couple of options.

Digital camera back. You sometimes can adapt a medium-format film camera by adding a digital camera back, which contains the sensors and electronics required for digital photography. The digital camera back often replaces the film holder on the camera. Obviously, having the ability to switch back and forth between film and digital photography with one camera body is an advantage to the professional photographer.

Integrated system. You also can purchase a new medium-format digital camera that's integrated in a complete system, containing the sensor and electronics required as part of the camera body. With an integrated solution, a professional photographer can have a camera designed to work as one system, theoretically improving speed and functionality.

Kodak's Pixel

Kodak's 50MP sensor makes use of a smaller pixel, the 6.0-micron Truesense pixel, than the company's previous generations of sensors (39MP and 31MP). However, the 6.8-micron pixels in the 39MP sensors used a similar basic design, as shown here.

In the illustration at left, you can see a top view of a 6.8-micron pixel. Each pixel contains two sections, an ITO gate electrode and a polysilicon (Poly) gate electrode. Either gate can collect light, although the ITO gate is more sensitive to shorter light wavelengths.

B1, B2, and B3 represent barrier regions around the buried channel (Bch). The buried channel confines the signal in the electrodes during exposure and readout. The channel stop (Chst) area isolates the pixel horizontally, and the lateral overflow drain (LOD) carries any excessive signal away from the electrodes. With smaller pixels, as used in the 39MP and 50MP sensors, the LOD is important for allowing larger charge capacities

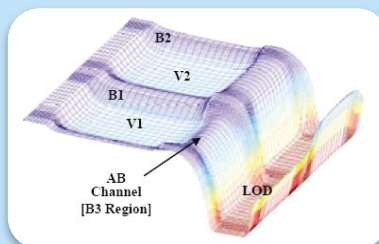
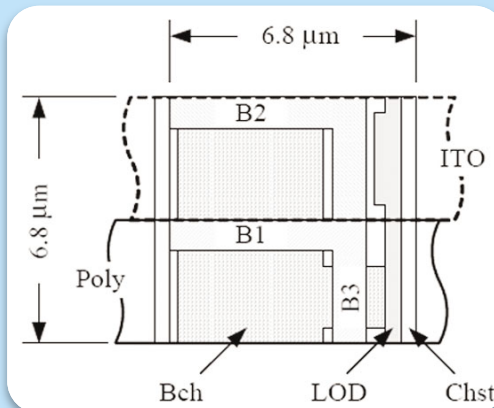
without affecting blooming control. (Blooming control refers to the pixel's ability to record a bright light source that saturates the pixel without bleeding electrons to nearby pixels that would negatively affect image quality.)

The illustration at left shows a 3D representation of the pixel in terms of voltage potential. V1 marks the polysilicon gate electrode, and V2 marks the ITO gate electrode.

As compared to the 6.8-micron pixel shown here, the 6.0 Truesense pixels offer advantages in several feature areas, according to Kodak's DeLuca, including a four-channel output design

for faster frame rates, lower power requirements, shorter lag time between the shutter click and the image capture, and use of a new red filter pigment for truer color accuracy.

"The new [50MP] devices are different because they are built using the Kodak Truesense 6.0-micron full-frame CCD platform," DeLuca says. ▲



Source: Kodak

Regardless of which medium-format solution you choose, the CCD sensor that records the image is the key to the amount of resolution you'll have.

The CCD sensors in medium-format digital cameras and in digital camera backs appear in different sizes and with different numbers of pixels, achieving different resolutions. For example, the Kodak 50MP sensor measures around 49.1 by 36.8mm (1.93 by 1.45 inches) and is much larger than those in consumer-level cameras. (Some professionals use large-format cameras, which have film sizes or digital sensors measuring 4 by 5 inches or larger and offering up to several hundred megapixels of resolution.)

The New Standards

At the time of Kodak's announcement of its 50MP sensor in July 2008, the new sensor replaced the medium-format camera industry's previous highest resolution

sensor, a 39MP unit, also from Kodak. A couple of weeks later, Phase One surpassed Kodak with a 60.5MP sensor it developed with DALSA Semiconductor. Leaf later announced a 56MP wide-frame sensor, again developed with DALSA Semiconductor.

The flurry of high-resolution sensors and related cameras equaling and surpassing the 50MP barrier thrust medium-format digital cameras into the spotlight.

"State of the art [was] at 39 million pixels," Kodak marketing manager for Image Sensor Solutions Michael DeLuca wrote in his blog at the time of Kodak's 50MP sensor announcement. "But in this market, image is everything. So, having the pixels and the performance you need is critical to capturing exactly the shot you want. So, now, 50 is the new 39."

Kodak KAF-50100 and Hasselblad H3DII-50. A few days after Kodak announced its 50MP CCD sensor,

Hasselblad announced that it would use the new sensor in its H3DII-50 medium-format digital camera, which will carry a price tag of about \$40,000.

Kodak's sensor offers an 8,176 x 6,132 pixel array. The KAF-50100 features pixels measuring 6 x 6 microns, smaller than the 6.8-micron pixels found in Kodak's 39MP sensor.

At September 2008's Photokina trade show in Germany, Hasselblad announced plans to release an H3DII-60 medium-format digital camera that will offer 60MP of resolution sometime this year. (During the initial announcement, details concerning the 60MP sensor, including the manufacturer, were not available.)

Phase One P 65+. Phase One's 60.5MP sensor, called the P 65+, measures 53.9 x 40.4mm (about 2.1 x 1.6 inches). The P 65+ has an active pixel array of 8,984 by 6,732. Phase One will offer the P 65+ in both a digital camera back (about

Kodak's Four-Channel Design

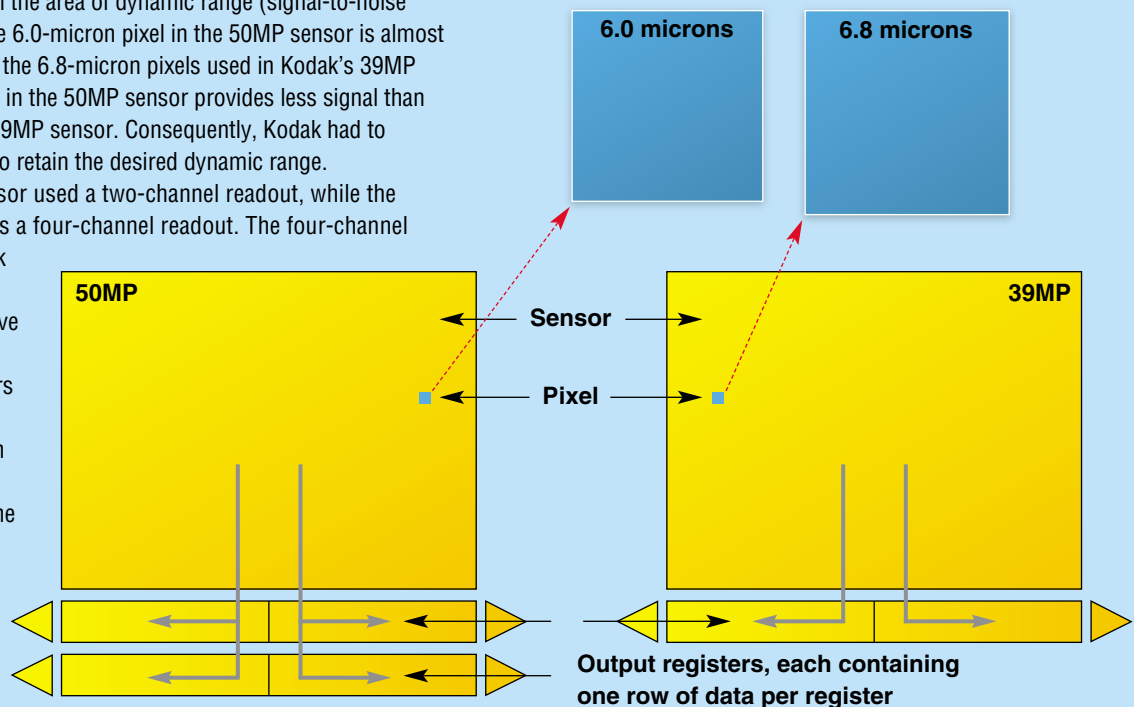
The new Truesense 6.0-micron Full-Frame CCD Platform technology from Kodak offers several interesting features for the 50MP Kodak sensor, beyond its 6.0-micron pixels. With Truesense 6.0, Kodak sought to increase the maximum resolution its sensor could provide without negatively affecting already existing features, especially in the area of dynamic range (signal-to-noise ratio). Because the 6.0-micron pixel in the 50MP sensor is almost 12% smaller than the 6.8-micron pixels used in Kodak's 39MP sensor, each pixel in the 50MP sensor provides less signal than each pixel in the 39MP sensor. Consequently, Kodak had to reduce the noise to retain the desired dynamic range.

The 39MP sensor used a two-channel readout, while the 50MP sensor uses a four-channel readout. The four-channel setup gives Kodak more bandwidth with which to move data, allowing the sensor's amplifiers to run at a slower pace (18MHz with the 50MP sensor, vs. 24MHz with the 39MP sensor), which reduces noise.

In the four-channel read-

out, two rows can reach the output register at one time, with half of the data going right and half going left. In the two-channel readout, only one row can reach the output register at one time.

The 50MP and 39MP sensors are essentially the same physical size, 49.1 by 36.8mm (1.93 by 1.45 inches). ▲



Source: Kodak

\$40,000) and in a digital camera system (about \$42,000).

“Photographers need real reasons to upgrade past 39 megapixel digital backs,” said Henrik Håkonsson, CEO of Phase One. “Real value includes higher resolution but also requires new functions, faster operation, higher quality through expanded sensitivity, increased dynamic range, better results in the studio or on location, and a better longer-term investment. I believe we are able to achieve this and more.”

At Photokina, Phase One also announced a marketing deal with Leica, which, at the same time, announced plans for a 37.5MP digital camera that it calls a hybrid between digital SLR and medium-format. The Leica S2 contains a 45 x 30mm sensor from Kodak.

Leaf AFi-II 10. Leaf’s AFi-II 10 medium-format camera system incorporates a 56MP CCD sensor. Leaf has two other AFi-II camera systems: The 7

(33MP) and the 6 (28MP). The company offers corresponding digital camera backs, called the Aptus-II 10, Aptus-II 7, and Aptus-II 6, all of which feature similar sensor resolutions.

The CCD sensor in the AFi-II 10 measures 56 x 36mm (about 2.2 by 1.4 inches) with a pixel array of 9,288 x 6,000. With its wider sensor, the AFi-II 10 offers a wider image capture than most medium-format cameras can achieve.

The AFi-II 10 will cost about \$43,700.

Although the 56MP of resolution in the Leaf/DALSA sensor draws initial attention to the AFi-II 10, Leaf Director of Marketing Seth Greenberg says the camera’s other features keep customers’ attention.

“Fifty-six megapixels is the first thing people ask about,” he says. “But, for us, it’s just something that we can do. We don’t want to get embroiled in a megapixel war. What really sets us apart are the features and what we do with that resolution.”

Finding Fifty

For professional photographers, the recent flurry of digital cameras and sensors with 50-plus megapixels of resolution was welcome news. Sony announced recently the largest resolution for a DSLR camera at 24.6 megapixels, which remains less than half the resolution available in the newest digital camera backs and medium-format cameras. Leaf’s Greenberg says he was impressed with the detail shown in the various prints displayed at the Photokina trade show from the Leaf medium-format cameras.

“The subtleties of light and shadow create some amazing images,” he says. “It’s an image that our [medium-format] cameras can achieve. You can’t achieve it with the mega-D-SLRs.”

As far as when less expensive cameras might see some of the technologies found in the new medium-format sensors. . . well, let’s just say unless you can

Development Of Digital Camera Backs

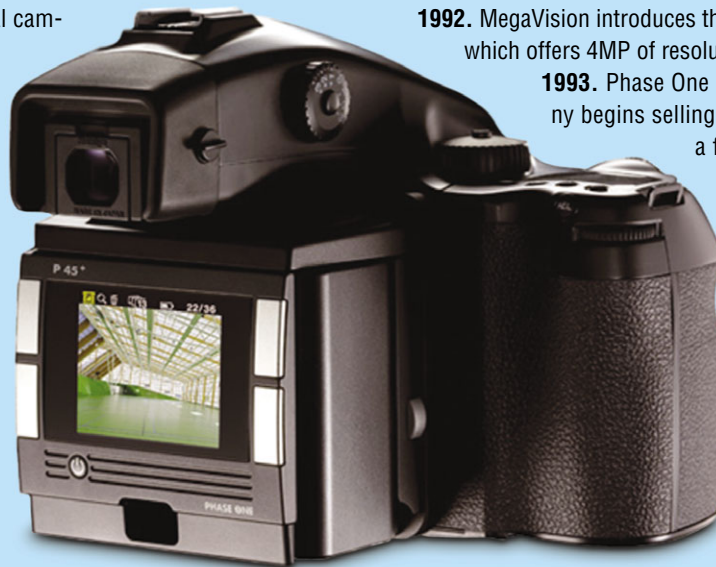
Leaf developed the first digital camera back for medium-format cameras in 1991, and it offered 4MP of resolution. Because the technology didn’t yet exist to move such large amounts of data efficiently, the early digital camera backs often used an external cable to connect to a computer for data download. Early models only shot in black and white, too, requiring the use of color filters and a trio of images to create color prints.

Digital camera back technology has advanced significantly in the past several years, especially in terms of resolution.

As you can see from this example, the digital camera back (the area containing the display screen) fits onto the back of this medium-format camera.

Some of the milestones in development of digital camera backs include those listed here.

1991. First digital camera back, produced by Leaf, offers 4MP of resolution. It’s called the DCBI (Digital Camera Back I).



1992. MegaVision introduces the T2 digital camera back, which offers 4MP of resolution.

1993. Phase One is founded, and the company begins selling digital camera backs within a few years.

1994. Leaf introduces DCBII, which remains at 4MP of resolution but offers other improvements.

1998. Leaf offers the 6MP Volare model.

2003. Kodak introduces the 16MP Pro Back Plus. Leaf quickly followed with the 22MP Valeo.

2004. Mamiya begins offering the Mamiya ZD, which is an all-digital medium-format camera that doesn’t require a digital camera back.

2004. Kodak purchases Leaf, making Leaf a subsidiary of the larger company.

2005. Digital camera backs offering up to 39MP of resolution begin appearing, including the P 45+ from Phase One (pictured here).

2008. A few different manufacturers announce plans to offer 50MP or more of resolution in digital camera backs and in medium-format digital camera systems. ▲

Sources: Phase One, Leaf, Wikipedia

fast-forward several years, you're going to have to wait a while.

In fact, Kodak's Antonio Ciccarelli, the company's worldwide marketing manager for Image Sensor Solutions, says the primary technology, the sensor, probably will not trickle down to consumer-level cameras anytime soon because medium-format digital cameras are using CCD technology, and consumer-level and D-SLR cameras are transitioning to CMOS technology in the sensors. CCD's superior image quality over

CMOS means medium-format cameras probably will continue using CCD for several years. One advantage of CMOS over CCD—processing speed—isn't as important in medium-format cameras. CMOS might eventually replace CCD in many types of cameras, but not for medium-format cameras, at least in the near future.

"CCD remains in very niche-type applications that require the utmost quality," Ciccarelli says. "CMOS has made some great strides."

In the end, some technologies found in the top-of-the-line models will trickle down to lower-priced cameras, giving photographers more features for less money.

That doesn't mean you'll find 50MP of resolution in a pocket-sized camera for \$400 in a decade, but it does mean the advancements in digital camera technologies are likely to continue, which is good news for all levels of photographers. ▲

by Kyle Schurman

CCD vs. CMOS

The medium-format image sensors discussed here all use CCD technology. CMOS technology is becoming more popular with consumer-level and digital SLR cameras, however.

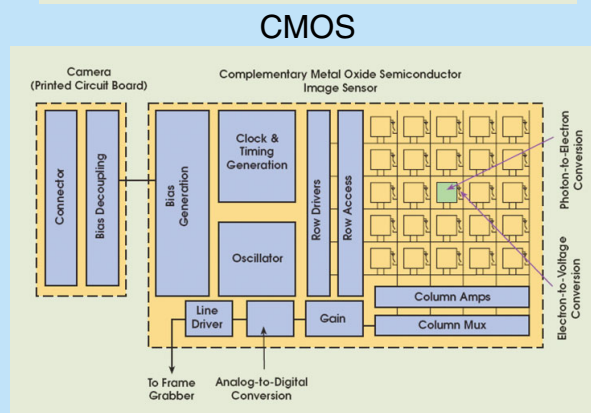
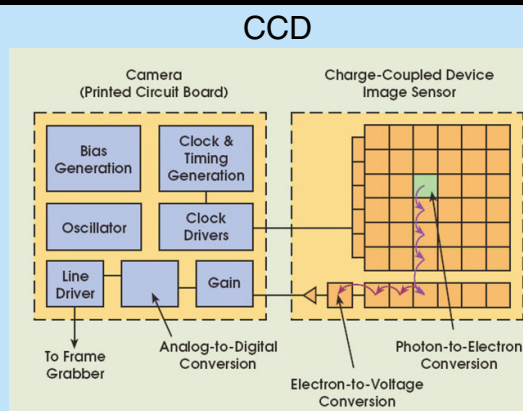
Both types of image sensors consist of pixelated metal oxide semiconductors. Each pixel (orange squares in these illustrations) accumulates charge proportional to the intensity of the light that strikes the sensor.

CCD. Bell Labs developed CCDs (charge-coupled devices) in the late 1960s. The original intent for CCDs involved temporary data storage, but RAM chips became the industry's preferred method. CCDs received a new assignment, proving to be a good choice for recording digital images. CCDs initially appeared in scanners and TV cameras in the mid-1970s. Digital cameras featuring CCD sensors first appeared in the late 1980s.

Although CCDs yield tremendous image quality, they can be more expensive to create than CMOS sensors because they use a different manufacturing process than other computer chips. CCD sensors also require more chips and electronics than CMOS sensors, causing them to use more power, to require more space, and to cost more in manufacturing. Finally, CCDs operate more slowly than CMOS sensors.

Despite some drawbacks, CCD image quality is outstanding, and CCD sensors appear as though they'll remain the only technology used with medium-format digital cameras. For professional photographers creating extremely high resolution prints, image quality is far more important than speed or sensor cost.

In the illustration here, the CCD image sensor handles the photon-to-electron conversion and electron-to-voltage conversion



processes. The charge packet from each pixel shifts from square to square before reaching the output register (bottom row of orange squares). The output register passes the data to the circuit board. This passing of data is one reason why CCD operates a little more slowly than CMOS. Other functions then take place on the circuit board to finalize the image data.

CMOS. CMOS (complementary metal oxide semiconductor) is the technology behind the manufacturing process used to make the sensors. Because of advances in manufacturing technologies in recent years, it has become easier to make CMOS sensors in volume. Rather than requiring extra chips and electronics to perform various functions, manufacturers can incorporate those items directly into CMOS sensors.

Because they cost less, provide good speed, and generate decent

image quality, CMOS sensors are appearing with more frequency in all consumer-level digital cameras, especially high-end digital SLR (D-SLR) cameras.

In the illustration here, each pixel in a CMOS sensor performs the full photon-to-electron-to-voltage conversion itself. The analog-to-digital conversion takes place on the CMOS sensor as well. With all of the image functions on the sensor, CMOS has a speed advantage over CCD.

Sony announced its development of a 24.8MP full-frame, 35mm format CMOS sensor early in 2008. Sony has aimed its sensor at digital SLR models. Canon also has surpassed the 20MP barrier for a CMOS digital SLR sensor with its 21.1MP unit. ▲

Source: DALSA Semiconductor



EYE ON OPEN SOURCE

An In-Depth Look At Linux & Beyond

Admit it: Even if you're not a Linux convert, you've at least been curious about open-source software. Forget idealistic notions about freeing yourself from the clutches of Microsoft's proprietary code and living a new life, reborn in a brave GNU world. You don't have to be a staunch supporter of Ubuntu or a tireless defender of Fedora to have an appreciation for open-source software.

In a sense, open-source software is a natural choice for you modding types. Sure, there are countless system tweak-ers, optimizers, and other utilities that help you get the most out of your software. And although we'd consider that modding, nothing says "ultimate software mod" quite like being able to tweak the operating system itself. If you have the programming chops, open-source software is both infinitely and personally customizable.

Open source has also made tremendous strides from the days of the command line. Linux distributions that used to require an almost otherworldly knowledge of the command line now sport functional, accessible GUIs that make them almost indistinguishable from their Microsoft and Apple counterparts. Perhaps it's going a little far to say that Linux is now an OS for the masses, but consider the inroads it has made.

For a few modern examples of open-source software's emergence as a factor in our everyday computing lives, turn to the

mobile world. Asus sparked a revolution in laptops, effectively creating a new class of laptop—the netbook—when it debuted the Eee PC. The tiny wonder, which (full disclosure!) has since become available in Windows, originally hit the scene with a variant of Xandros Linux. Another portable PC that has grabbed its share of headlines is OLPC's (One Laptop Per Child) XO-1. The XO-1, designed with the intent of equipping children in developing nations with PCs, used its very own customized (infinite customization at work, see?) Sugar OS. These two pint-sized powerhouses proved that open-source software is more than just viable: In some cases it's advantageous or even desirable.

Open-source software's success, at least in the mobile space, must be infectious, because the Google-led Android charge is taking the battle to one of the industry's juggernauts: Apple. When it comes to portable electronics, it's tough to beat the two-headed monster of the iPod and iPhone, but Android, as seen in T-Mobile's G1 mobile phone, is certainly poised to give Steve Jobs a run for his money. The G1 was released less than two months before we went to press, so it's too early to tell whether Android and the G1 will make a dent in Apple's momentum. But the mere fact that so many people are onboard with Android (yes, having Google at the helm helps immeasurably) is promising.

And while we're on the subject of Google, the Web search leader recently brewed up its own open-source Web browser. Maybe you've heard of it? Well, for all you cave and under-rock dwellers, Chrome is here, and it's definitely made its mark. Chrome is based on the WebKit engine and is currently compatible with Windows, but Mac OS X and Linux browsers shouldn't be too far off.

Looking for open-source PVR software? You got it. How about a financial app, now that tax season is upon us? It's out there. Why, there are even plenty of open-source video games, provided you're willing to be generously forgiving about the graphics. Put simply, open-source software covers every area of the computing world. It's just too ubiquitous to ignore.

This month, we have a brace of articles covering open-source operating systems and software. And don't worry if you're still a little wary (OK, really wary) to become a born-again Linux convert: We have plenty of open-source software that runs on Windows and Mac OS; a lot of it rivals or even beats closed-source programs of the same kind. We finish with a one-page rundown of the essential apps any self-respecting open-source user can't live without.

Welcome to Penguin Country. ▲

by Vince Cogley

58 DISTRIBUTION JUNCTION

Go Beyond The Basics

64 PARADE OF PROGRAMS

Complement Your OS With These All-Star Apps

70 OPEN-SOURCE ESSENTIALS

See What Made Our List



DISTRIBUTION JUNCTION

Go Beyond The Basics

So, you've heard about Linux and how stable and powerful it is. You're thinking about trying it out. But you keep hearing about how one distribution is better, faster, or more stable than another—maybe a combination of all three. As a result, you're not quite sure about the differences among Linux distributions. Or maybe you're an old hand at Linux and have been interested in other Linux flavors. If you fall into either category, then this article is for you.

Ubuntu

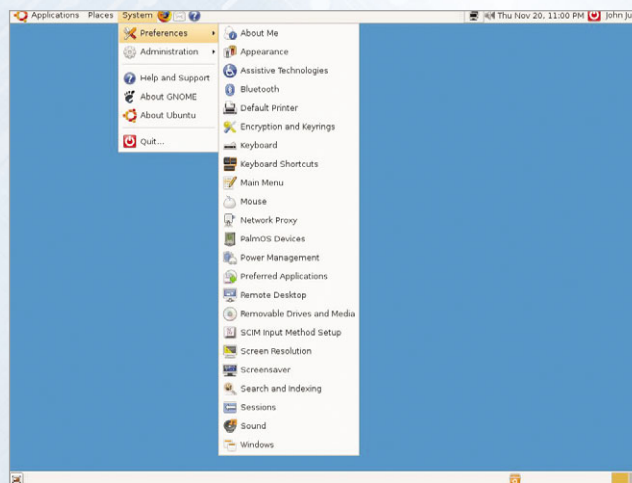
The first Linux release that we'll cover is the very popular Ubuntu distribution (www.ubuntu.com). According to some

sources, it's the most downloaded Linux of the past four years. Ubuntu is what we consider to be the most "Mac-like" of all the Linux releases. That is, before the Mac came out, everything about computers was a text interface, and you had to be taught how to use it. But when the Mac came out, its GUI made it easy enough for the casual user to learn. Ubuntu is much the same way. It eliminates lots of things that can confuse people and, as a result, is very easy to use.

Installation is quick and easy, requiring little knowledge of computer terminology. There are a lot of other distributions that, during the course of an install, due to historical reasons, ask a semi-techie question.

Most people simply take it on faith that the default answer is the right one, but they don't know why. Installing Ubuntu involves none of that. You can breeze through the installation and have a good feel for what you're doing.

Added to its easy install is its modest footprint, requiring only 4GB of disk space for a typical install. In terms of being easy to use, Ubuntu comes with a lot of drivers turned on by default; as a side effect, it boots slower than other Linux distributions. The default install of Ubuntu comes with Firefox for the Web and Evolution for email. For instant messaging needs, there's Pidgin, and for all your office-related stuff, there's the OpenOffice.org suite. For your



Ubuntu has taken the open-source world by storm, and it's easy to see why. The user-friendly Linux distribution has a relatively simple installation process and an attractive UI.



multimedia player, there's Totem and MPlayer. And if you want to spend some time relaxing, there are also a few games.

If you get stuck or have questions you can tap into the Ubuntu community for free help (www.ubuntu.com/support/communitysupport). This comes in the form of online forums, IRC chat channels, and mailing lists, all from links available from Ubuntu's home page. The Ubuntu home page can help you locate Local Ubuntu Teams, which are basically regional user groups that can provide some free help. All of the community support options are available by going to Ubuntu's home page.

If you want commercial support, Canonical, which develops Ubuntu, offers paid support, but this option is primarily aimed at business and enterprise users. Annual support costs start at \$250 for desktop users and offer weekday support during normal work hours. On the high end of the support spectrum is \$2,750/year for around-the-clock, on-call server support. These costs include phone and email support along with upgrades during the year.

You can get Ubuntu as a downloadable CD image that you can burn to a blank disc. (You can also boot Ubuntu as a LiveCD, which boots the OS from the disc itself.) If you don't have broadband or just want physical media, you

can also have a free CD of Ubuntu shipped to you.

Fedora/Red Hat

Next, we'll cover one of the oldest and most well-known Linux distros: Fedora (www.fedoraproject.org). Even if you've never heard of Fedora, you might be familiar with its commercial counterpart: Red Hat Linux. (Red Hat is also the name of the company that produces these distributions.) Red Hat was one of the first companies trying to make money off of Linux shortly after the free OS hit the computing scene. When it first emerged, the traditional Unix vendors such as HP, IBM, and Sun were selling hardware, software, and services. Initially, people wondered if Red Hat's business model of only selling services was viable, but as Linux took hold other vendors took the same approach.

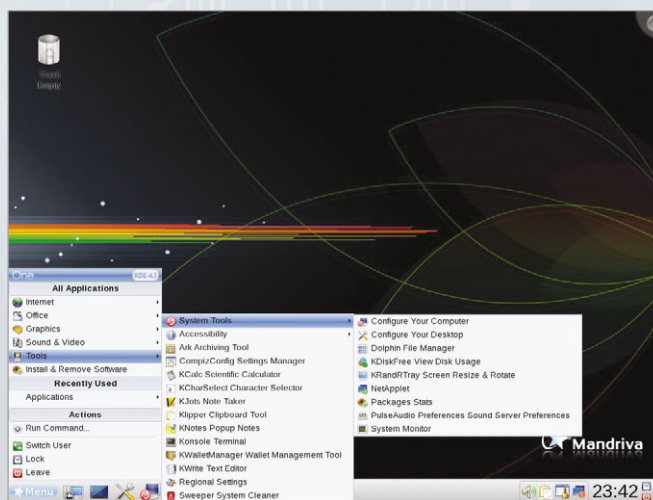
Installing Fedora isn't particularly difficult; the defaults are fine for most people. But there are a few things that can trip up people who aren't familiar with Linux in general. In particular, the package selection phase of the install should be avoided by anybody not comfortable with Linux. It lets you choose from the literally hundreds of packages that can be installed. This is both good and bad, because the true power user can take control of what packages Fedora loads during

installation. Newbies, on the other hand, face information overload.

Once installed, Fedora comes with pretty much the same set of apps that Ubuntu does, although you'll notice different versions. One notable shortcoming is that Fedora only includes the Totem media player. Linux media players are notorious for having hit-and-miss format support, so there may be some media you can't play correctly. Fedora only requires about 3GB of disk space, but it has slightly fewer end-user apps. It does, however, boot up a tiny bit faster than Ubuntu, but it's nothing significant.

As with other Linux distributions, Fedora offers free community support, which basically amounts to end users helping each other. Like Ubuntu, you can subscribe to mailing lists, join IRC channels, participate in online forums, and read the online documentation from Fedora's home page. Although you can file bug reports for the developers who occasionally lurk in mailing lists, support for Fedora is largely up to the users.

If you want a more formal support approach, you'll have to look to RHEL's (Red Hat Enterprise Linux) product line. There, you'll find four Desktop and three Server versions, respectively. All of the versions have the same base release, but they offer different add-on features. There



The name has changed, but the speed hasn't. In our tests, Mandriva booted faster than Ubuntu and Fedora.



are also a myriad of support options for all of the versions, so there's a wide variety of pricing options. On the low end, you can spend \$80 for RHEL Desktop with basic support. This gives you free software updates for one year with Web-based support and two-business-day response. On the high end, \$6,747 gets you RHEL Advanced Platform and a three-year Premium Subscription, which includes software updates, Web support, and 24/7 phone support for an unlimited number of incidents.

Mandriva

We'll forgive you if you've never heard of Mandriva (www.mandriva.com), because the name has only been around for three years. It isn't that Mandriva is new to the Linux world—quite the opposite: it's been around for more than 10 years. Prior to 2004 Mandriva was known as Mandrake Linux, but due to a lawsuit over the name “Mandrake,” the developer (now Mandriva SA) had to rename the distribution.

Installing Mandriva is quite different from installing most other Linux distributions. When you boot into the CDs of other distributions, you can either run the image on the CD or install that distribution. Mandriva lets you do both. When you boot into the Mandriva CD, you're

asked a few trivial questions and then you're running the CD image. You can keep running off of that image and, whenever you feel like it, click the Live Install button on the Desktop to install Mandriva.

Installing Mandriva is so easy you almost don't realize you're doing it. You're asked a series of straightforward, though slightly techie, questions, and then it gets installed on your system. The most intimidating question asked during the install is how you want the disk partitioned. The typical Mandriva install will use about 2.2GB of disk space. (6GB is recommended, however.)

Despite its small footprint, Mandriva comes with the typical set of open-source apps you'd expect. It comes with Firefox and Totem media player, as well as OpenOffice.org. Although it's loaded with a lot of programs, Mandriva boots up extremely quickly, about 25% faster than Ubuntu or Fedora.

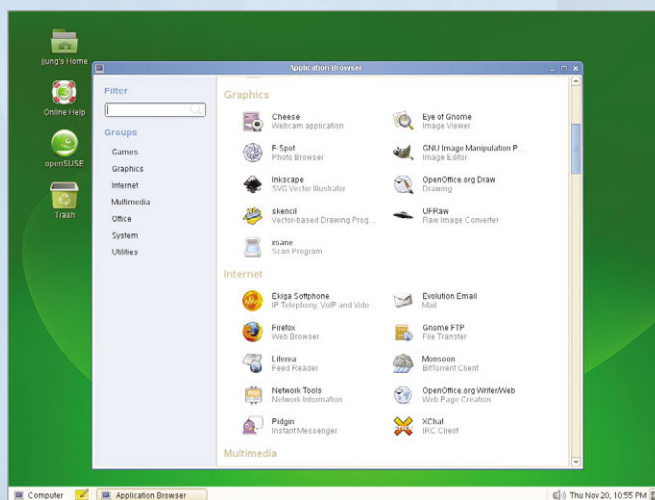
Support for Mandriva comes in the form of the typical online community support. Discussion forums, mailing lists, IRC chat channels, and an online, constantly updated wiki are all available for free from Mandriva's home page. For commercial support purposes, Mandriva offers a per-incident support policy either by phone or over the Web. Prices are in Euros, so the price can

change slightly because of current exchange rates.

Support incident prices range from 30 Euros for a single incident logged over the Web up to 400 Euros for 10 incidents made over the phone. Pricing for Mandriva Corporate Server is a bit more complicated. On the low end, for 250 Euros, you can download the server version and all updates for it for one year, but you can't log any support requests. 279 Euros gets you a retail version of the server software in a box, one year of updates, and one year of unlimited Web-based support incidents. For 390 Euros, you can download the server software, get three years of updates, one year of unlimited Web-based support incidents, and one month of unlimited phone-based support incidents.

openSUSE/SUSE Linux Enterprise

Novell is a well-known and established software company dating back to the early years of the PC. It's probably best-known for Novell NetWare, a cross-platform networking environment. However, as the PC market grew and Microsoft moved into the server and networking fields, Novell found itself losing market share. Among the many things Novell did to find new revenue streams was buy the Linux vendor SUSE. Novell then released a completely open-source version of SUSE Linux, known as



openSUSE is the brainchild of an industry vet, Novell. It also includes the complete suite of Evolution apps.



openSUSE (www.opensuse.org), with frequent releases. The company also offers another version of SUSE Linux with some proprietary software to companies, dubbed SUSE Linux Enterprise Desktop and SUSE Linux Enterprise Server.

Installing openSUSE is mostly harmless in that all of the defaults are quite safe. The only real problem with its installation is the last screen before it actually installs stuff. When you set out to install openSUSE, you're asked a series of questions, which is to be expected. But when you get to the last screen, you're shown all your options plus some you were never asked. Dwelling too much on the last page or poking around some default selections can be intimidating. But if you just trust the options you selected, you'll be fine.

openSUSE uses about 3GB of disk space and comes with the standard fare of software that other distributions include. Despite using up this much space, openSUSE boots faster than most distributions. It also includes some software that isn't part of most other distributions, such as RealPlayer. The biggest and most impressive set of programs that comes with openSUSE is the full Evolution suite.

Other distributions will only give you the Evolution mail client, but openSUSE gives you all of Evolution's other tools. This is significant because the Evolution

suite of applications will work with Microsoft Exchange Server. So, for corporate environments, openSUSE and its commercial SUSE Linux Enterprise Desktop deserve a good hard look. The reason that openSUSE is able to include the full suite and others aren't is quite simple: Novell makes Evolution.

You can download a full installation DVD image from openSUSE's home page that you'll have to burn to use. If you spend \$59.95, you can get the retail box software, along with 90 days of installation support by phone or email. If you need help with other parts of openSUSE, you can go through online community forums or join mailing lists; many are offered in a variety of languages.

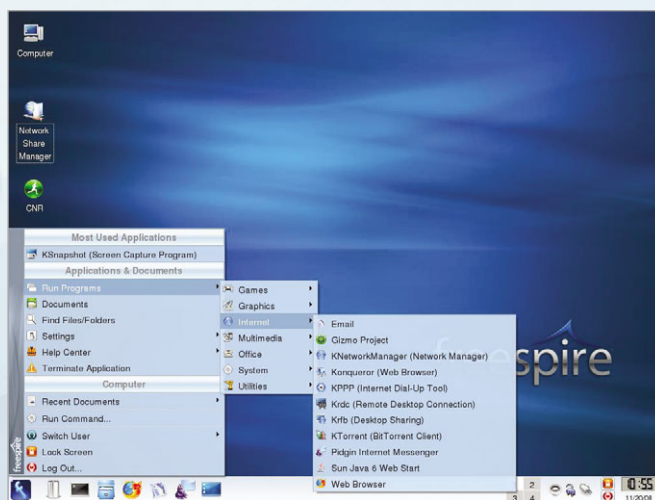
But if you want someone to call for support beyond just installation, then you'll have to look at Novell's SUSE Linux Enterprise family of products. This is a complete suite of Linux distributions tailored to suit any corporate need. Pricing for this stuff is complicated because Novell sells maintenance and ongoing releases of the software separately from support, which you can call for help. But prices start at \$120 for one year of maintenance and a 12-hour window during the weekdays to call for support. The typical high-end support can go up to more than \$4,000 for three

years of maintenance and around-the-clock priority support.

Freespire/Linspire

Freespire (www.freespire.org) may not be a particularly well-known distribution of Linux, but that's because it's a relatively new flavor. It's based on an earlier version of Ubuntu, and so you're no doubt wondering why you should even mess with a derivative of a better-known release. The reason is because Freespire is probably the least open-source of the Linux distributions. It's one of the few Linux releases that includes proprietary closed-source code. This means that Freespire will be able to do more with some multimedia files and hardware than other Linux distributions. Although most users will find this perfectly acceptable, much of the open-source crowd has a big problem with it. But if you don't have a problem with this mixing of open- and closed-source software in one package, Freespire is worth a look.

The installation program of Freespire takes its task literally, as all it focuses on is getting the distribution on your system. If you want to be able to choose specific software packages or a special partitioning scheme, look elsewhere. You're simply asked for basic networking information and the destination disk for the installation. Other questions relating to the



Freespire has drawn criticism from open-source purists for its use of proprietary code, but for compatibility with media formats, it's tough to beat.



system are asked after the 1.9GB distribution is on your system and boots up the first time. And Freespire boots up a tad bit faster than Ubuntu, even though it came from the same base.

Freespire is available as a free download of the CD image or for \$10 for a physical CD. Free support is available through the online discussion forums and searching Linspire's knowledgebase. If you want to work with a support person, it'll cost you from \$24.95 for a single support incident up to \$149.95 for an annual subscription. The support is provided through Freespire's Web site, with no phone support option available.

Not surprisingly, Freespire has a commercial version, known as Linspire (www.linspire.com), which is actually quite well-known. Linspire was originally known as Lindows until Microsoft sued Linspire for trademark infringement. Microsoft lost the suit but appealed the case, but during the appeal the two sides struck an agreement. Lindows would be renamed to Linspire, and Microsoft would buy the Lindows name.

Linspire is most often found preloaded in store-branded budget computers, usually as a cheap alternative to the Windows systems. But if you want to see what all the fuss is with the proprietary software, you can get a Linspire CD for \$49.95. Along with selling you the commercial CD and possibly support incidents, Linspire has other ways of upselling products and services to you.

Freespire and Linspire both come with a client for CNR (www.cnr.com). CNR is a site where you can download and install third-party products. Some products are merely links to free Web pages, such as YouTube, while others are full-fledged commercial products. Generally if you buy something from CNR, you also get support for that product from CNR.

Gentoo Linux

Gentoo Linux (www.gentoo.org) is named after the Gentoo penguin, which is the fastest-swimming penguin. The goal of this community-based distribution is, you guessed it, speed. And does

Gentoo ever deliver on speed. It's the fastest-booting Linux of all the distributions in this article. It's essentially a modern Linux distribution stripped of most of its user-friendly bells and whistles and optimized to your system. And when we mean it's optimized for your system, we mean that literally. Gentoo software packages are made for your specific machine.

Where other distributions will give you all sorts of open-source apps that work for most people, Gentoo only really gives you a Web browser. The Gentoo community didn't want to guess what mail client you might want to use, so you can decide that for yourself. Similarly, you don't have to override someone else's decision on your office suite: Install the suite you like best. It's a very minimalist approach, and you're going to have to poke around to find what you want.

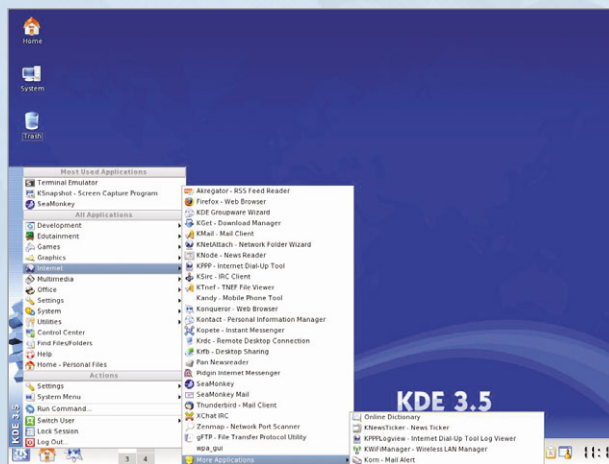
Gentoo is available via free download of any number of CD images for various processors. If you don't have the connectivity to download full CD images, you can always order a CD from online retailers starting at around \$2. Installing Gentoo is done by booting from the free LiveCD image and then clicking the installer icon on the Desktop. The actual installation starts by asking you to partition the disk before it starts its initial file copy.

Other Linux distribution installers will ask you a series of questions and then copy

all the relevant files. Gentoo's installer will ask you a few questions, copy files relevant to those questions, and then ask you some more questions. At first, it asks for the basic disk layout and copies the basic system files. After you've been asked about the networking configuration, it copies the networking-related files over, and so on.

Unless you're familiar with Linux, you should just accept the defaults. One thing to note is that when it asks about optional software packages, just install everything. This makes the installation use 2.2GB of disk space but requires less guessing on your part. The questions can be somewhat technical, and the installer has no problems not copying files you may need because you didn't know to have it load them. Another bit of advice is that once Gentoo is installed on your system, use the XFCE Session when you log in, because chances are that's the only graphical environment you'll have available.

The biggest difference that Gentoo has over every other Linux distribution is how you install additional software on the system. With other distributions, you can download packages of precompiled software and install them on your box. Gentoo uses Portage as its package manager, but it doesn't download precompiled software. Portage downloads the Gentoo-friendly source code for a package and then builds the package on your system.



Gentoo takes a minimalist approach to Linux. Everything about its installation is completely customizable.



This has the advantage of making the software run optimally on your particular system. (Didn't we tell you it was optimized for your system?) However, for very large packages, such as the OpenOffice.org suite, it can take several hours to days to install, depending on your system.

Because Gentoo is a community-based distribution, it relies on its own community for support. There are mailing lists, discussion forums, and IRC chat channels you can use to get help using Gentoo, all from Gentoo's Web site. But if you're looking for a 1-800 number to call or a Web site to log a support ticket, you won't find it here. However, Gentoo claims its developers frequent community channels to participate in discussions and answer questions.

Gentoo isn't like the previously mentioned Linux distributions that have commercial entities behind them. It does have corporate sponsors that provide some hardware and services, but its developers contribute their free time. If you like their work, you can always make a donation. They do have an online store where you can buy clothes, mugs, and other swag with the Gentoo logo.

Slackware Linux

Some people criticize open-source software as being dependent on the will of a few die-hard people for support. If those people suddenly stop doing work on a

particular product, that product dies. Slackware Linux (www.slackware.com) was one of the first major Linux distributions to prove that assertion incorrect. Slackware Linux isn't just the oldest Linux distribution still maintained, developed, and in use. It's also a community-based Linux, meaning there's no company behind it. It continues to exist because of its own established community.

Although much has changed with Slackware Linux, one thing that has changed the least is the install. It's still a text-based installation like the original Slackware 1.0 release, and its installation questions are clearly geared for the techie crowd. If you don't know a good amount about computers and Linux, you might want to avoid Slackware and stick to the commercial distributions. The defaults are generally safe, but the questions the Slackware installer asks are cryptic to all but the advanced users.

Should you brave it and install Slackware, you will be rewarded with a distribution that uses 4.2GB of disk space for a full install. And when you first boot up, Slackware will be in text mode. You read that correctly: After you've gone through the entire Slackware installation, you will not have a graphical environment. This isn't a bug, this is its intent. Slackware is based on the computing concept known as KIS (Keep It Simple). It is

as feature-rich as you want it to be, but by default, Slackware assumes nothing.

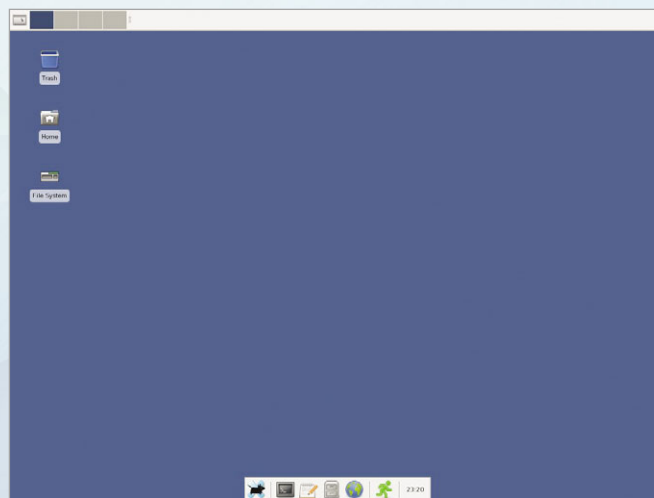
Thankfully, the full install of Slackware *does* come with a user environment; it just doesn't impose it on you. If you want to go with the default environment, you'll have to modify the `/etc/inittab` file and change the line that says `id:3:initdefault:` to `id:4:initdefault:` and reboot. If you're not familiar with using Linux text editors in a text interface, you shouldn't try to use Slackware.

If you've done a full install and enabled the default graphical environment, Slackware will boot pretty quickly. In fact, it's the second-fastest distribution we timed in our rundown of Linux distributions. A full install of Slackware comes with a lot of open-source applications. Along with the usual suspects, you'll find multiple Web browsers, mail clients, and media players. Unlike Linux distributions that include OpenOffice.org, Slackware includes Koffice, one of its competitors.

Only Scratching The Surface

This is by no means a comprehensive evaluation of Linux distributions. But hopefully we've shown you the pros and cons of some well-known and less-known flavors for you to try. ▲

by John Jung



Slackware has the distinction of being the oldest currently maintained distribution of our lot.



PARADE OF PROGRAMS

Complement Your OS With These All-Star Apps

There was a time when bragging about not paying for your software would get you a visit from the Business Software Alliance anti-piracy unit, but the OSS (Open Source Software) Movement has gifted the computer users a wealth of free software that's legal both to use and modify. With hundreds of thousands of OSS packages out there, selecting the best of the best can take more than a little time. Luckily for you, we've done the hard work of finding the cream of the crop. We've rounded up utilities, productivity software, and even a few open-source games. All you have to do is read, download, and enjoy.

To that end, we're supplying you with close to two dozen quick-take reviews of our favorite open-source software, ranging from simple utilities to full-blown applications. Most of the applications we've selected are available for Linux and Windows. The utilities tend to be more Windows-centric, mostly because Linux comes with most of the utilities you'd need. We're also letting you in on several open-source programs that are actually far superior to their commercial counterparts and then sneaking a peak at what's new in the open-source gaming world.

Open-Source Utilities

Cobian Backup 8 (Windows)

It seems as though authors of different backup programs have different ideas about how a backup program should work, and we like the thinking behind Cobian Backup 8. You tell CB what files you want backed up, how often you want them backed up, and how many previous versions of backed up files it should keep on hand; it does

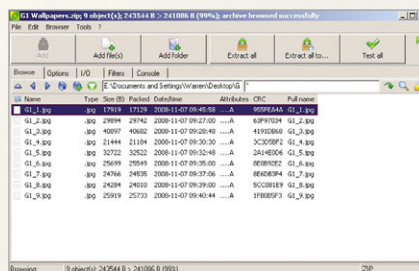
the rest. It can optionally execute programs or scripts before or after the backup job and perform system restarts. Although it can't write to optical media, it writes to everything else (including network stores) and stores backups in easily readable and widely compatible ZIP files, making emergency recovery a snap. The latest version (version 9) reverts to a closed-source (but still free) model, but version 8 (also known as "Black Moon") will always be open source and available, says its author.

Cobian Backup 8

www.cobian.se



PeaZIP 2.4.0 (Windows, Linux)



Although WinZIP is the *de facto* standard when it comes to compression programs, the fact that new versions haven't really added significant new features (and that it still costs money), has opened the door to alternatives. PeaZIP is among the most popular of the free alternatives for a lot of reasons. It's attractive UI is also simple to use, there are Windows and Linux versions (including a "Portable" version that works great on a flash drive with either

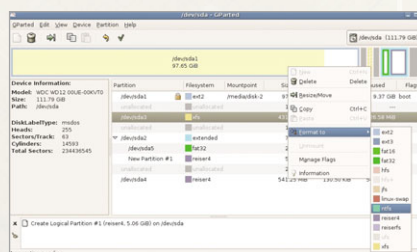
OS) that all look and work the same, and it opens many compression formats that even some commercial products can't handle, such as RPM, WAR, JAR, etc. It can even extract the contents of ISO files, though it can't "rebuild" them. Other than an occasionally inaccurate progress bar, there aren't any significant weaknesses with PeaZIP.

PeaZIP 2.4.0

peazip.sourceforge.net



GParted 0.3.9 (Linux)



There was a time that when you wanted to work with the partitions on a hard disk, your choices were either the low-featured fdisk that came with DOS or a somewhat expensive commercial package, such as Partition Magic. There are now plenty of free partition managers that still rely on cryptic text-based interfaces, but GParted is our favorite full-featured and friendly-to-use partition tool. It can create and nondestructively resize, move, copy, check, and format partitions in close to a dozen different formats with drag-and-drop ease. GParted is available on most Linux distros, but it's also available to run from a



standalone boot CD, bootable flash device, or even as a network-launched PXE (preboot execution environment). Its only fundamental flaw is that certain partition moving procedures take much longer than some commercial products, but it's nothing that making a sandwich can't solve.

Gparted 0.3.9

gparted.sourceforge.net



Partimage 0.6.7 (Linux)

Whether you need to deploy a group of identical computers with identical hard drives and software or you just need to make a whole disk or partition backup, Partimage has picked up the baton from Norton Ghost 2003. Using a full-featured (if somewhat complex) text-based GUI, partimage creates and restores disks from compressed disk images, including partition tables. It supports all the major Linux OSes and has "experimental" support for NTFS (meaning it works great for Windows XP's NTFS, but not so great for Vista's NTFS) and beta support for HFS Mac OS' filesystem. It can write directly to CDs and DVDs and work with images over a network, either via SAMBA/NFS or its own networking protocol. Partimage is available as a standalone app, but most users deploy it (version 0.6.6, which is just as effective) via the free SystemRescueCD (www.sysresccd.org).

Partimage 0.6.7

www.partimage.org



JKDefrag 3.36 (Windows)

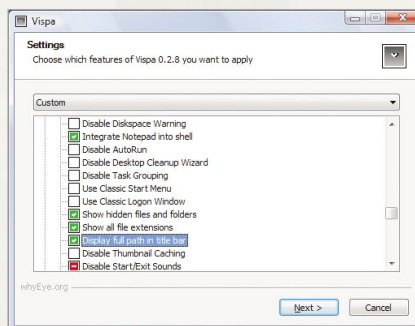
Windows has a long and glorious history of including totally brain-dead disk defragmenters, so JKDefrag is a welcome change to the free disk-optimization scene. It comes in four versions: a standard Windows program with a basic GUI, a command-line version, a DLL library suitable for your own projects, and a screensaver version. On top of this, there's a 64-bit Windows version. Its optimization scheme is actually intelligent, putting folders at the beginning of the disk, "normal" files in the middle, and "space hogs" at the end, where they are likely to need more space as they are modified. JKDefrag's GUI is a little primitive, but there's a free (but not open-source) program called JKDefragGUI (www.emro.nl/freeware) that offers a quick and easy way to access all the hidden commands JKDefrag has to offer.

JKDefrag 3.36

www.kessels.com/Jkdefrag



Vispa 0.2.9 (Windows Vista)



Of the dozens (hundreds?) of Windows system tweakers available for

download and purchase, we could only find one that is truly open-source, as in "the source code is freely downloadable for anyone." This rules out most freeware, such as the excellent CCleaner, from our list. Vispa is, as far as system tweakers go, a fairly basic utility, offering you a quick way to turn about 75 of Vista's hidden features and annoyances on and off. Vispa displays a collapsible list of checkboxes, one per feature, and you just check or uncheck what you want, with the program offering to make a Restore Point before enacting changes. For now, Vispa is Vista-only, but then, only Vista has UAC, which nearly everyone wants to turn off immediately. WinXP users can look for its open-source cousin Xpy (xpy.whyeye.org).

Vispa 0.2.8

vispa.whyeye.org



AutoHotkey 1.0.48 (Windows)

DOS had batch files to automate repetitive tasks. Windows has AutoHotkey, which has evolved into far more than a simple scripting language. To be sure, it is easy to remap one keystroke for another—or a mouse movement, or even a joystick movement—but when you want to do more, AutoHotkey shines. Although there is a slight learning curve for more complex actions, AutoHotkey can directly manipulate files and folders, work with DLLs and the Registry, and pop up windows for basic input. It will compile scripts into standalone EXEs, so recipients of your scripts don't need to have AutoHotkey installed. There's no

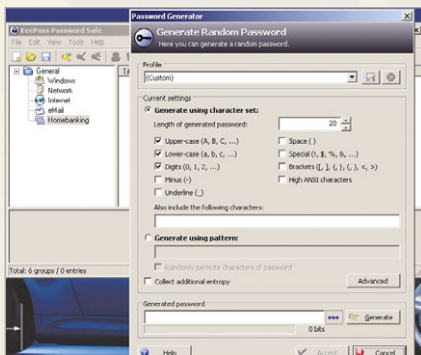
**AutoHotkey 1.0.48**www.autohotkey.com

built-in tutorial, but there is a huge library of scripts available to both use and study.

ClamAV 0.94.1 (Linux, Windows)

Whereas there are many categories of software where open-source programs give their commercial counterparts a run for their money, the antivirus category is not one of them. (Of course, this is only a major concern for Windows users currently.) Perhaps it takes too many full-time resources to focus on both good definitions and detection rates, as well as background functionality. As such, ClamAV forgoes background scanning completely, instead expecting to be called via its API to quickly scan a single file or set of files, which is very handy if you're creating an email server and need to scan attachments for viruses. A basic GUI is available for the Windows version (called ClamWin; www.clamwin.com), but it, too, only performs foreground scanning. Detection rates generally fall below the commercial competition, but ClamAV is a good first line of defense in certain situations.

ClamAV 0.94.1
www.clamav.net

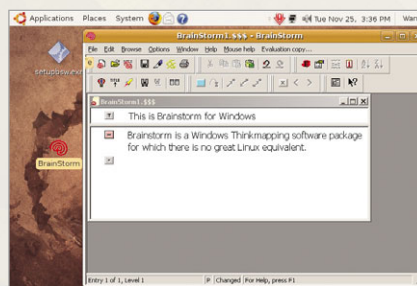
**KeePass 1.x/KeePassX 0.3.4 (Linux, Windows, Mac OS, and others)**

We've covered the need to store your passwords within an encrypted,

password-protected file instead of just writing them down, and KeePass is among the most universal password lockers there is, with versions for Windows, Linux, Mac OS, Symbian, Palm OS, Windows Mobile, and BlackBerry, along with portable drive/U3 versions, too. To add to the confusion, the Linux version was renamed and then forked into its own set of Linux/Windows/Mac OS versions called KeePassX, but all versions act very similarly.

In essence, each stores your account information and passwords in a hierarchical tree structure, with the storage file encrypted with either AES or Twofish algorithms. Plus, there are plug-ins that support other encryption methods if you work in an organization that requires it. Both KeePass and KeePassX are very easy to use and attractive, with KeePass able to sync with certain handheld devices and KeePassX able to share the same storage file between OSes on a network drive or equivalent.

KeePass 1.x/KeePassX 0.3.4
keepass.info; www.keepassx.com

**Wine 1.0.1 (Linux, Mac OS)**

Wine is not an emulator, says its acronym, but it does enable most programs written for Windows to run in various Unix and Linux environments where it is installed. Developed for more than 15 years, Wine hit the magic "1.0" version in 2008, and this version is reflective of the high level of compatibility it enjoys. Wine implements a compatibility layer, translating calls to typical Windows DLLs into appropriate Linux

calls, although you can supply Wine with actual Windows DLL files for even greater compatibility. Windows software running via Wine appears directly on the Linux desktop, interacting seamlessly with the host operating system. Famously, some Windows software seems to run better under Wine than under Windows Vista, which is a neat trick.

Wine 1.0.1
www.winehq.org

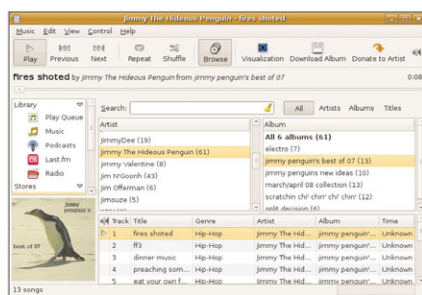
**VirtualBox 2.0.6 (Windows, Linux, Mac OS)**

Sometimes you need to run a Windows program that refuses to work under Wine, or you want to test something without "contaminating" your base operating system, be it Windows, Linux, or something else. In these cases, Sun's VirtualBox is the answer to your prayers, provided you have an installation disc of the OS you want to run virtually. VirtualBox works a lot like older versions of VMWare Workstation, emulating the basic hardware of a "typical" computer within its window and then letting that window run within the desktop of another operating system. VirtualBox is surprisingly fast, and a built-in disk-image-snapshot system makes testing and rolling back a snap. VMWare's commercial offering provides better tools for mass image deployment, but most users can use VirtualBox to do nearly anything VMWare can, but for hundreds of dollars less.

VirtualBox 2.0.6
www.virtualbox.org

**Open-Source Applications**
RhythmBox 0.11.6 (Linux)

RhythmBox is, on the surface, the Linux equivalent to iTunes, although over the years it's evolved into something that's a little different. Like iTunes, RhythmBox can browse, sort,



organize, and play MP3s and other audio files. Like iTunes, it can subscribe to and manage podcasts and tune into Internet radio. Like iTunes it can work with an iPod, letting you add and remove songs and playlists. Also like iTunes, it can rip music from your CDs and burn CDs from your playlists. Unlike iTunes, it can't log into the iTunes music store and purchase commercial music that's protected, but as an alternative it can log into the Jamendo (www.jamendo.com) and Magnatune (www.magnatune.com) music sites and do purchases and downloads. Its general layout is similar to you-know-what, and any iTunes user will feel right at home using it.

RhythmBox 0.11.6

projects.gnome.org/rhythmbox



VLC 0.9.4

(Linux, Windows, Mac OS)

If you have a video file on your computer, odds are that VLC can play it. Period. Sure, sure, it's fully skinnable so it can integrate with your particular OS/desktop. Of course, it comes with almost all of the necessary codecs built-in, so you don't need to search around for codec packs. Naturally, it can play commercial DVDs (and was in fact the first Linux player to do so by using the libdvdcss DVD decryption library). To top it off, there are other neat tricks, such as direct support for playing back movies within ISO files, even if the native filesystem can't work with ISO files, the ability to play back incomplete or damaged video files without choking,

and it even has filters for de-interlacing, rotating, overlaying logos, and a lot more.

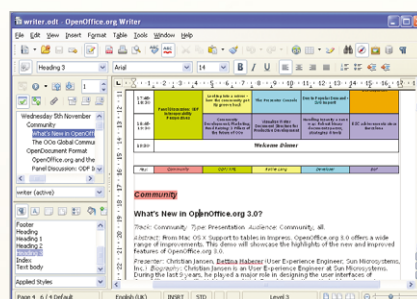
VLC 0.9.4

www.videolan.org



OpenOffice.org 3.0

(Windows, Linux, Mac OS)



Combining a top-notch word processor, spreadsheet, presentation program, database, and a drawing program into one suite, OpenOffice 3.0 is a compelling tool that should handle all of your office document needs except for one: the need to look stylish while doing it. OpenOffice looks and feels the way Microsoft Office did 3 years ago, even down to the somewhat pedestrian graphics within its charts in its spreadsheet, Calc. To those who dislike Office 2007's Ribbon, this is a huge advantage, but to those who normally use Office 2007, OpenOffice's GUI is likely to disappoint. Still, its core functionality, right down to its compatibility with the new Office 2007 file formats, is impressive and can satisfy students and businesspeople alike.

OpenOffice Suite 3.0

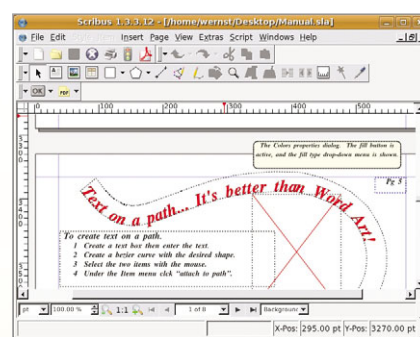
www.openoffice.org



Scribus 1.3.3.12

(Linux, Windows, MacOS)

For large documents, or for documents with layouts too complex for a word processor to handle, Scribus is the



open-source answer. Looking a bit like an older version of PageMaker or Microsoft Publisher, Scribus lets you do all the classic desktop publishing tasks, such as creating frames for text and graphics, flowing text around art elements, and creating master pages for repeating layouts and design grids. Postscript and PDF/X3 output are excellent, as is CMYK color support. Unfortunately, there are no import filters for documents created with other DTP programs, no Pantone spot-color support, and the GUI is a little crude at times. Still, the well-written documentation should guide you through your first project easily enough, and the output is dazzling in the right hands.

Scribus 1.3.3.12

www.scribus.net



GnuCash 2.2.7

(Linux, Windows, Mac OS)

Do you find Microsoft Money and Quicken too simplistic? Were you trained in the intricacies of DEC (double-entry accounting) and want a financial software package that follows those principles? If so, then GnuCash was made for you. GnuCash can keep track of bank accounts, stocks, income, and expenses using a checkbook register metaphor, but it never strays too far from DEC ideas. It has excellent QIF (Quick Interchange Format)/OFX (Open Financial Exchange)/HBCI (Home Banking Computer Interface) file importing abilities and good online banking support. It's even suitable for

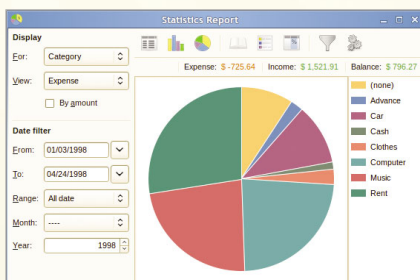


running small businesses, too. GnuCash doesn't look as flashy as its commercial competitors, but it gets the job done properly.

GnuCash 2.2.7
gnucash.org



HomeBank 4.0
(Linux, Windows, MacOS)



For those who think GnuCash is a bit too "industrial strength," HomeBank may be a better alternative. Able to directly trace its lineage 13 years back to its Amiga-based ancestor, HomeBank is a simple and elegant alternative to commercial alternatives. It sports a friendly and simple interface that's just right for a simple household budget. It's able to import and export QIF files and export OFX files, but there's no direct online banking options. Clean-looking graphs make budgeting a snap, and auto-completion of payees and bills ease data-entry efforts.

HomeBank 4.0
homebank.free.fr



Firefox 3.0.4
(Linux, Windows, Mac OS)

Really, what can be said about Firefox you don't already know? It's simply a more secure, faster, more customizable, and more full-featured Web browser than any other offering. It gets regular, automatic updates to protect you from the latest Web-based threats. It's fully



themable, allowing it to seamlessly integrate with any desktop environment or screen size you throw at it. Optional modules, called Extensions, let you tailor Firefox to your every whim, whether you're a neophyte or power user. Quite simply, there's no reason for you to not be using Firefox as your everyday browser.

Firefox 3.0.4
www.mozilla.com



Evolution 2.2 (Linux, Windows)

Those looking for an open-source replacement for Outlook need look no further than Evolution. Combining business-class email with contact management and calendaring functions, Evolution works well both with local datastores (for when you're working alone) or with Microsoft Exchange servers (for when you're working within a group.) Small organizations can use any one of the many iCalendar services to sync schedules while continuing to use POP and IMAP for email, allowing for good flexibility. The clean interface even looks a lot like Outlook, making a transition very simple.

Evolution 2.2
projects.gnome.org/evolution



MythTV 0.21 (Linux, Mac OS)



MythTV is essentially a homebrew TiVo system that can do much more than TiVo ever could, including

Open-Source Games

It seems most games are full commercial enterprises, but we've found two open-source games worth taking a look at from different sides of the gaming spectrum.

MAME 0.128
(Linux, Windows, MacOS)

MAME emulates the hardware platforms that made up your favorite arcade games, be they '80s classics like Elevator Action to modern fighting games. Just download the ROMs for the games themselves, save them in the right folder, and start saving your quarters from the clutches of the local arcade. Various GUIs help make the setup of MAME less complicated and are worth investigating. MAME prohibits the reselling of its otherwise available source code, which flies in the face of some open-source definitions.

MAME 0.128
www.mamedev.org



Multi Theft Auto v1.0-dp2.3
(Windows)

Grand Theft Auto: San Andreas is a fun game, no doubt, but wouldn't it be more fun if it was a massively multiplayer online game? Download and install Multi Theft Auto to your legally purchased GTA: SA game, and with a little tweaking and research, it becomes the MMO of your carjacking and drug-dealing dreams. MTA had been a closed-source mod for years, but it's just gone free, and development is expected to surge ahead as a result. ▲

Multi Theft Auto v1.0-dp2.3
www.mtasa.com





download videos from all over the Internet (not just Netflix), hook into and play your personal media library on your network, and burn DVDs of the programs it has recorded. MythTV works best when you have a PC connected directly to your television and to your cable system/satellite dish, so it will never be as common as a set-top box. But with it, you'll be watching TV at 100% efficiency. MythTV can be a little tricky to set up, but distros like Mythbuntu and Knoppmyth simplify the process dramatically.

MythTV 0.21

www.mythtv.org



Miro 1.2 (Linux, Windows, Mac OS)

Miro combines a Web browser, media player, and BitTorrent client all in one to make Internet TV a real pleasure. This might seem like a silly mash-up at first, but think about this workflow: Use a site like TVRSS.net to get daily updated RSS feeds of television episodes being shared via BitTorrent. Copy this URL into Miro, which makes it a "Miro Channel," and as new episodes of your favorite programs become available, Miro starts downloading and seeding them automatically. Double-click a downloaded episode to start playing it. Don't worry about codecs: Miro comes with all the codecs you need. Then Miro performs house-keeping, automatically deleting old or viewed episodes like a TiVo. It's not compatible with 640 x 480 resolutions, but that's basically Miro's only problem.

Miro 1.2

www.getmiro.com



Open-source software tends to evolve new products faster than its commercial competition, so we look forward to the improvements the next generation of software will surely bring. ▲

by Warren Ernst

Better Than Commercial

Most folks have the impression that open-source products are weaker imitations of commercial software titles, but Firefox is a huge example of this not being the case. To that end, here's two more OSS products that beat all comers.

Wireshark 1.0.4 (Linux, Windows, Mac OS)

If you've ever wanted to peek inside the traffic zipping along your network cable (or wireless LAN, for that matter) the *de facto* standard tool is Wireshark (formerly Ethereal). Wireshark "speaks" literally hundreds of networking protocols and can provide live data capture and analysis, or it can look at a previously captured data stream. There is a steep learning curve for a tool this powerful, but many online tutorials can get you started quickly.

Wireshark 1.0.4

www.wireshark.org



TrueCrypt 6.1 (Linux, Windows, MacOS)

Whether you want to create an encrypted section of a disk, an encrypted drive partition, or partition an entire disk (including the area on which the OS resides), TrueCrypt stands in a league of its own. Utilizing either AES or Twofish encryption algorithms, TrueCrypt also delivers a measure of plausible deniability by letting you create an undetectable encrypted "drive" within the known encrypted drive, all with stunning ease and very few slowdowns. ▲

TrueCrypt 6.1

www.truecrypt.org





OPEN-SOURCE ESSENTIALS

See What Made Our List

Having used Linux for several dozen years, we've seen all manner of Linux distributions. Although we have the most experience with Fedora, openSUSE, Debian, and Ubuntu, we're comfortable with most distributions. That said, our preferred distribution is openSUSE, with Fedora coming in second.

We know a lot of Ubuntu fans will be wondering why we didn't pick the user-friendly distribution; there are two big reasons for this. First, by default, you can't log in as root from the Ubuntu login screen. Yes, a Linux vet should be able to configure Ubuntu to allow login as root, but why not just enable it out of the box? Another reason we prefer openSUSE over Ubuntu is openSUSE's centralized administration interface. YaST (Yet another Setup Tool) provides instant access to all the admin activities in openSUSE, while Ubuntu makes each task a separate menu item under the System>Administration menu.

Now that we've picked our open-source OS champion, what about the apps? Here's what we'd make sure was installed on our ultimate system before starting to use it heavily. There are a few faces that every power user will notice and some that regular "Warm Up To Penguins" readers might remember.

Firefox. This best-known open-source Web browser isn't always installed on all systems. It should be. Its Adblock Plus, FireFTP, and DownThemAll extensions are all useful by themselves.

Thunderbird. The email companion to Firefox is great for most email needs and passable for USENET newsgroups.

GNU Screen. This tool is useful for anybody running lots of console apps. GNU Screen lets you put a shell into the background and reconnect to it at any point.

mtr. Also called My traceroute, this program combines ping and traceroute into a nifty little network debugging tool.

Wireshark. For all your network troubleshooting needs, get this packet sniffer. There's also a nice, friendly GUI that breaks down the data it captures into more manageable views.

iptables. Whether your system is directly on the 'Net or acting as a home router, iptables is the best firewall tool to have. Your kernel should have it by default, but you still need the end-user application.

Firewall Builder. This is a GUI interface for iptables (because most people don't want to learn *all* those switches in iptables).

Emacs. We like vim for quick and dirty text editing, but for heavy-duty stuff, we always break out Emacs. Both have their places and will get regular use as text editors, though vim is in all distributions.

vlc and xine. We can't name just one multimedia player because we've found different files that will play on one but not the other. But these two used together cover all the bases.

GParted. This tool is too useful not to have, regardless of which Linux distro you use. Although it can't do Linux RAIDs, it can create *gpt* disk labels, an ability you'll need for those 2TB+ disks.

GCC. When you're ready to hack the Linux OS itself, you'll need a C compiler. This is the one to use. GCC (GNU Compiler Collection) is also handy for the weird stuff that won't install automatically.

GIMP. This is the best-known, high-end, open-source graphics-editing program, which some compare to Photoshop.

XnView. This image slideshow program comes with a nice set of extra features, such as rotate, zoom, and crop. It

also does screen grabs. You also might want to look at Picasa and xv.

Audacity. If you're into editing audio files, then this is a good starting place. It's not a professional-level audio editor, but it's a good starting point.

Cinelerra. Who doesn't want a high-end, free, open-source video-editing program? If video-editing isn't your top priority but you'd still like a solid program, then get Avidemux instead.

OpenOffice.org. This Microsoft Office alternative is probably the best-known open-source office suite for a reason. No other open-source office suite comes close to matching OpenOffice.org's quality and features.

GnuCash. This program helps you manage your finances and comes with features similar to Quicken. You can even import QIF (Quicken Interchange Format) files.

LinCity-NG. Does that name sound somewhat familiar? LinCity-NG is an open-source derivative of the classic SimCity—fun for people who want to run their own city.

PlaneShift. This is for those into MMORPGs. It's free to download, free to play on the servers, and there are no premium upgrades.

Bos Wars. Command & Conquer fans should be drawn to this open-source, cross-platform RTS. Bos Wars runs on Linux, BSD, Windows, and Mac OS X.

Of course, these are our picks for the best apps that we insist on having on our open-source system. These are programs that we turn to first when we need to do a particular task, but there are plenty of other great apps. ▲

by John Jung



R-4 BULLDOZER

GMC
Innovation & Design

Middle Tower ATX Case

- Innovative & Unique Design
- Efficient Internal Structure
- Supports Full ATX
- Supports largest graphics cards
- Supports 7 extension slots

Front Panel Function

- World's first patented ODD (Optical Disk Drive)
- Stylish front Fan with LED Light
- Easy removal of ODD cover



X-7 X-STATION

Middle Tower ATX Case

- Innovative & Unique Design
- Multi-power switch (top & front)
- Efficient Internal Structure
- Supports Full ATX
- Supports largest graphics cards
- Supports 7 extension slots

Front Panel Function

- Internal system monitoring with front LCD
- 1 x Sliding ODD cover
- Supports 4 x ODD (3 x 5.25" and 1 x 3.5")

X-Fi FORTE 7.1

LOW PROFILE AUDIO CARD

- Creative X-Fi™ Native PCI Express audio processor.
- Better Circuitry. Better Components. Better Audio.
- Low-profile and standard-profile brackets.



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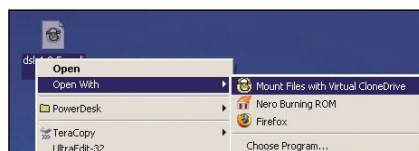
The Bleeding Edge Of Software

Inside The World Of Betas

Virtual CloneDrive 5.4.1.2 Beta

Though optical drives are basically built into all computers but netbooks, there are times when it's handy to ditch the CD or DVD. Virtual CloneDrive's main goal is to let you leave your discs at home by emulating a physical CD or DVD drive via software drivers, letting you mount virtual disc images in place of physical media. There are quite a few programs that already do this, but there aren't any that share VCD's simple interface, rock-solid stability (even in beta form), and a low, low price of "free."

VCD works with a few popular disc image formats, including ISO, BIN, and CCD. Once installed, just double-click one of these files to mount the disc image to the phantom drive letter created, and then interact with the disc image as if it



Virtual CloneDrive 5.4.1.2 Beta

Publisher and URL: SlySoft, www.slysoft.com

ETA: Q1

Why You Should Care: Never before has working with ISOs been so free and easy.

were an actual disc. If it's an ISO of a DVD, you can use your favorite DVD player to watch the movie on it. If it's an ISO of a Linux distro disc, you can use your favorite file managers to copy files directly off the disc/out of the ISO file. When you're done, just right-click the

phantom drive lever and choose Un-mount Virtual CloneDrive from the pop-up menu, and the image file is closed. Like optical discs, such files are write-only, so you'll need another tool for mastering new image files. SlySoft can afford to give away VCD because it happens to sell the software needed to make disc images of your own. How convenient.

Frankly, other than cluttering your system with up to eight extra drive letters, we're hard pressed to find anything wrong with the current beta, or the product in general. It doesn't leave a desktop icon or Start menu folder, and therefore there are no instructions—not that any are really necessary except how to uninstall it (look in the Add/Remove Programs Control Panel). And we doubt you'll want to uninstall it. ▲

by Warren Ernst

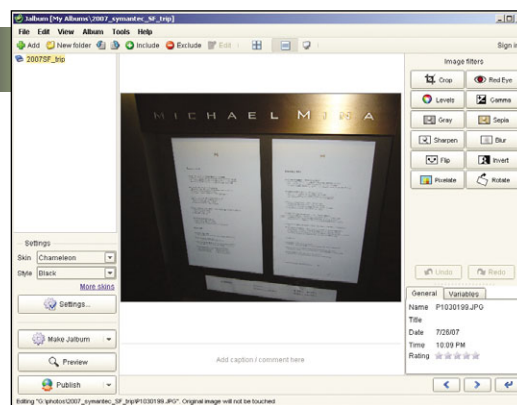
Jalbum 8.1 Beta

While there's no doubt that Web sites such as Flickr and all-encompassing photo-management programs (and their complimentary online services) such as Picasa have brought the management and sharing of digital photos to the next level, sometimes they can be a bit much. Sometimes you just want to take a handful of photos and get them online in an attractive manner, perhaps even on your own Web site. In these situations, Jalbum makes a compelling case, offering an option that is in some ways superior to "the big guys."

Programmed in Java (with versions for Windows, Mac, and Linux), the Jalbum window lets you drag and drop photos (or folders full of them) into its staging area. If you like, you can work with each photo to adjust brightness, crop, sharpen, remove red-eye, and perform many other basic editing tasks that we've all become familiar with, thanks to iPhoto and

Picasa. Also like Picasa, these editing tasks don't alter the original photo file in any way, though edits are saved in a Jalbum data file in case you want to generate the exact same album again.

Once you've selected and worked with your photo album, Jalbum will make you an attractive album using HTML, CSS, and lots of neat JavaScript tricks and optionally offer to FTP it to your own servers or Jalbum's free photo-sharing site. The neat part is that there are hundreds of high-quality album templates available for download—they're nearly all free, but expect to see amazing commercial templates in the future. Creating your own templates isn't rocket science, either, so if you're handy with the code, you can probably make just what you need (and even share it) before too long.



Jalbum 8.1 Beta

Publisher and URL: Jalbum AB, www.jalbum.net

ETA: Q2

Why You Should Care: Roll your own photo-sharing site with ease.

Despite being written in Java, Jalbum is fast, stable, and even attractive—well worth a look if you want to easily share photos on your own Web site without installing something to your server. ▲

by Warren Ernst

UP TO SPEED

Upgrades That'll Keep You Humming Along

Some favorite tools such as MozBackup, Xfire, CCleaner, and Easy CD-DA Extractor get refreshed this month, while ATI and Nvidia graphics card owners enjoy driver updates.

Software Updates

Adobe Flash Player 9.0.124.0

This set of critical patches for the common multimedia player fixes vulnerabilities to DNS rebinding attacks and HTML injection.

www.adobe.com

Adobe Reader/Acrobat 8.1.2

The ubiquitous PDF reader software and its full-version parent plug up JavaScript vulnerabilities to remote code execution.

www.adobe.com

BitComet 1.06

The update for this popular torrent client includes several GUI enhancements. The main menu items have been rearranged. The directory setting, Web Interface setting, and HTTP/FTP task properties have all been improved. A number of changes to the core affect download limits on HTTP task and the long-time seeding module.

www.bitcomet.com

Boinc 6.2.19

The distributed computing software for volunteer projects, such as SETI@Home, fixes a compiler warning and a GDI/memory leak in the screen saver.

boinc.berkeley.edu

CCleaner 2.13.720

The venerable file cleaner now supports Firefox 3.1 and cleans Windows Error Reporting files. A right-click option allows cleaning of individual items in the tree. Also new is Include/Exclude list editing.

www.ccleaner.com

Easy CD-DA Extractor 12

The CD ripping tool adds a new Accurate-CD-DA Audio CD ripping engine. There is better 64-bit support and more metadata properties supported. The UI is improved and overall performance tweaked. Audio codecs are updated, as well.

www.poikosoft.com

Lotus Symphony For Windows 1.2

The Lotus spreadsheet, presentation, and word processor suite improves loading and saving performance with ODS and XLS files. There are also enhancements to performance and exported PDF accessibility through tags and attributes.

symphony.lotus.com

Mass Downloader 3.6.759

The download accelerator for Web and FTP sources adds file renaming using comments, new integration of Internet Explorer, preview of RAR archives before downloading, and bug fixes.

www.metaproducts.com

Microsoft Malicious Software Removal Tool 2.4

This is the latest iteration of the long-standing malware detector and extractor from Microsoft. The 2.4 version updates the profiles to current infectious strains of Blaster, Sasser, and other common pests.

www.microsoft.com

MozBackup 1.4.9 Alpha

This backup for Mozilla Firefox, Thunderbird, and SeaMonkey adds options for backing up without compression. It also fixes a handful of bugs.

mozbackup.jasnepaka.com

Opera Mini 4.2 Beta

Opera claims 20 million monthly unique users of its Web browser for phones. This version is skinnable and improves support for YouTube and other mobile video sites. Improved Opera Link features allow sharing of notes, bookmarks, and recent URLs with others. This browser works with a wider variety of phones, as well.

www.opera.com

Xfire 1.100

The game chat and multiplayer tool increases the number of simultaneous chat rooms you can visit to 10. Bug fixes include better in-game interface sync when joining chats, a fix for Far Cry, and key binding issues. The update adds support for a number of newer titles.

www.xfire.com

Driver Bay

ATI Catalyst 8.10

This version of the Radeon drivers and control software adds fan speed control during acceleration and can force component video detection. In Vista, video corruption in some Blu-ray titles is fixed and so is flickering in dual-link displays.

www.amd.com

Creative X-Fi 2.18.0004

This update to the audio card drivers re-establishes Dolby Digital and DTS decoding for cards that included the features in Windows XP drivers and restores DVD-Audio playback for cards that included these applications in the XP software suite. Fixes include resolving a crash when switching to an unsupported sampling rate in Audio Creation Mode while Dolby Digital Live is enabled.

www.creative.com

GeForce Release 178.24

These WHQL-certified drivers for most of Nvidia's GeForce cards add support for new GeForce 9-series motherboard GPUs. These drivers also fix some application compatibility issues.

www.nvidia.com

Data Sanitization Utilities

Good Enough For The DoD,
Good Enough For Me

Most people know that deleting a file on a computer means little in terms of keeping data discreet. Essentially, all a “deletion” does is remove a reference, or pointer, to a file, leaving the file itself parked somewhere on your computer. And for the most part, nobody cares. You don’t want the file anymore, so you delete it. Out of sight, out of mind.

The problem, of course, comes to light when it’s time to get rid of a hard drive or a whole computer. Whether you’re giving away the computer, selling it second-hand, or simply pitching it to the curb, you know that even though you’ve deleted all your files, they’re still there somewhere on the hard drive, like a juicy apple waiting to be plucked by an enterprising person hunting for information. Even if you reformat or use FDISK (which merely cleans the partition table), someone can still recover your data.

Data miners have developed some incredible recovery tools including Active File Recovery; PRML (Partial Response Maximum Likelihood), which is used to reconstruct data on magnetic drives; magnetic force microscopy; and even a method of studying erase bands on the hard drives themselves.

These tools may sound ominous, but this technology isn’t being developed just so thieves can snatch your credit card number. It’s intended for use by authorities to prosecute cybercrimes and uncover evidence needed to convict criminals.

In any case, once a hard drive is out of your hands, there’s no telling where it will end up. If you want to be sure your deleted data can’t be accessed by anyone ever again, you need to take the next step in data deletion with a data sanitization utility.

International Standards

Data sanitization utilities can’t actually remove data, but they overwrite it with all zeros or random characters to make it indecipherable. How good is this method? Good enough for the U.S. Department of Defense, which publishes the 5220.22-M standard for data sanitization.

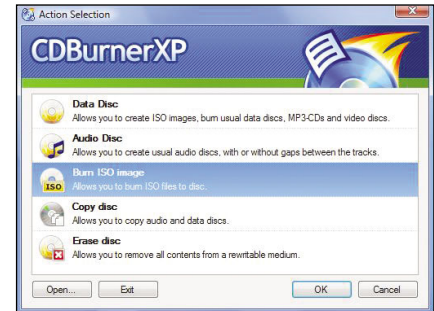
But the DoD standard isn’t the only one around. Other international standards include the Russian GOST p50739-95, German VISTR, Gutmann method, Canada’s RCMP TSSIT OPS-II, and PRNG Stream. Each has varying levels of sanitization. For a good comparison between most of these, Darik’s Boot And Nuke offers a breakdown of each when you’re inside the program.

Darik’s Boot And Nuke

Darik’s Boot And Nuke, more commonly known as DBAN, is a popular open source data sanitization application. It’s a self-contained boot application that you must install to and run from some type of removable media.

There are a few versions available from Sourceforge; for most users, you have the option of using the version designed to be installed on a floppy diskette or USB flash drive, or one designed for CDs and DVDs. It’s purely a matter of preference which one you choose. The third option, preview release 2.0.0, is necessary if you have a newer Intel Core 2 Duo or AMD processor or an Apple MacBook Pro.

After failing to install DBAN to either a floppy diskette or a USB flash drive, I gave the CD/DVD version a try. DBAN’s Web site suggests you use CDBurnerXP to burn the ISO image, so I downloaded it from www.cdburnerxp.se and installed



Darik’s Boot And Nuke

Free

dban.sourceforge.net



it. Upon launching CDBurnerXP, you’ll see a button for burning an ISO image; easy as pie.

Oddly, there are no instructions online for using DBAN, and the ReadMe file is thin at best, but one can ascertain what to do from the nature of the beast—it’s a boot program and I had it on a CD, so I restarted the computer, configured the BIOS to boot from a CD, and waited. The program launched from the CD with no problems.

Press ENTER to enter Interactive mode. From here you can select specific partitions you want to wipe, as well as what type of method you want to use: Quick Erase, RCMP, DoD Short, DoD, Gutmann, or PRNG, and some important information about each. You can also select the number of rounds to be performed. Navigation is a bit ungainly as you’re in DOS mode, but otherwise it’s pretty intuitive and straightforward. When you’ve made your selections, press F10 to start the process. If you just want to use autonuke at this juncture instead of manually selecting which method to use,

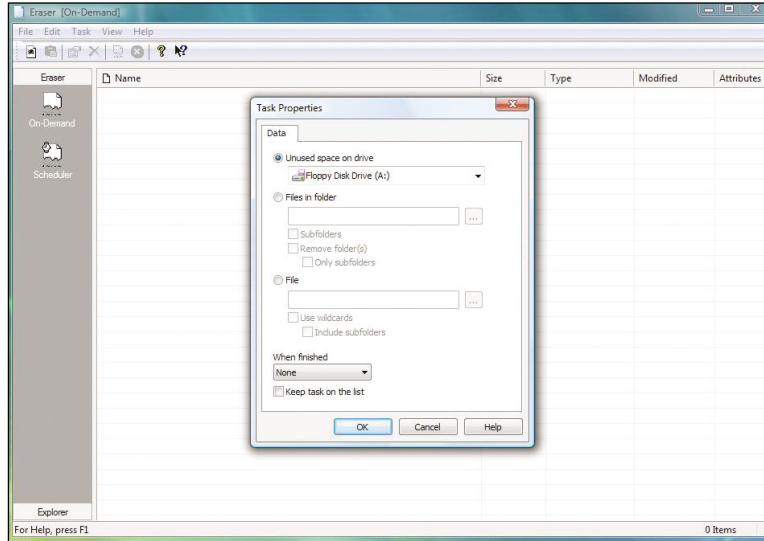
type in the command and press ENTER.

Depending on your chosen method and the size of the doomed drive or partition, this could take quite a while—as in many hours. That’s not unique to DBAN, though; all of these programs take a long time to do their work.

I have to say, though, as simple as DBAN is to use, I prefer to have some more specific instructions, as I don’t like taking guesses on how to use something that could wipe out the wrong partition or drive if I make a misstep. It’s like having a jar of hydrochloric acid without a label.

Heidi Eraser

Although in name it sounds like a young Swedish female hitman (hitperson?), Heidi Eraser is a tool that erases data with a friendly user interface and many options. It’s an application that



you can install on your hard drive and run from a Windows environment as opposed to a DOS-based program like DBAN. It actually functions as a nice complement to DBAN—in fact, DBAN recommends Heidi Eraser on its Web site. The difference between the two programs is that DBAN just blasts whole drives and partitions while Eraser grants you much more flexibility in exactly what you erase.

Heidi Eraser

Free

www.heidi.ie/node/6



With Eraser, you can wipe specific files and folders, encrypted drives, and media such as flash drives, CDs, and DVDs. You can also kill off temporary files such as swap files, Internet cache, your Recycle Bin, and more. You can even wipe clean unused space on a partition or drive.

Eraser is incredibly intuitive and easy to use. When you start a new task, you get a window with three tabs and no nonsense. You choose unused space on a drive, a folder, a subfolder, or a specific file to erase from a couple of drop-down menus. Because data wipes can take an enormous amount of time, the program gives you options for what the computer should do when Eraser has finished its task, such as shut down or sleep. On another tab, you can choose which method of sanitization you want to use. Eraser even features drag-and-drop functionality, so you can just drag individual files or folders to their doom.

Finally, if you’re a little paranoid and want to make sure your data is routinely as shredded as possible, you can set a day and time for regular data wipes.

When you’ve set your options, click OK and let it run.

One knock on Eraser is that it’s a Windows-only tool, so Linux and Mac users are out of luck. And for as useful as the myriad deletion options are, stick with DBAN or another data sanitization tool for a complete hard drive wipe.

Active Kill Disk

Active Kill Disk is a powerful program that offers data sanitization through either DOS or through Windows. I downloaded the free suite (the full suite costs \$59.95). However, it lacks a few features of the full version, most notably the ability for the

Degaussing & Destruction

Using a data sanitization utility with DoD-level encryption is a good way to effectively wipe out data from a hard drive, but degaussing and physical destruction are even better.

Degaussing is a process that uses electromagnetic energy to erase data from any magnetic storage. Cassette tapes, video tapes, and hard drives all fit into this category. Though quite effective, degaussing is hard to do simply because the machines are expensive. Good luck finding one under a thousand bucks. However, you may be able to pay a service to degauss for you.

Physical destruction is not only the single best way to destroy data, it’s easily the most fun. You can be creative, too, within reason and municipal safety codes. Drilling holes in the disk platters, smashing them to pieces with a hammer, and even smelting are sure ways to permanently erase data.

There are machines that destroy hard drives, as well. Verity Systems (www.veritysystems.com) makes a machine called the VS7000 Hard Drive Destroyer, which crushes hard drives of any size with an easy hand crank. It’s a little pricey at just over \$5,800, but it’s definitely effective. These are more useful for companies rather than individuals.

The best way to guarantee the death of a hard drive is to recycle it. There are many avenues for recycling electronics, and many manufacturers have programs for reclaiming the raw materials in their obsolete devices. Once a hard drive’s raw materials have been harvested, there’s absolutely no data left to be discovered. ▲

Active Kill Disk

\$59.95

www.killdisk.com



user to define the number of passes, random characters (the free versions offers all zeros only), customizable security levels, and compliance with the DoD, VISTR, GOST, and Gutmann standards. OK, so it's basically worthless without paying for the full version, but it's still a good way to test it out before you drop the cash.

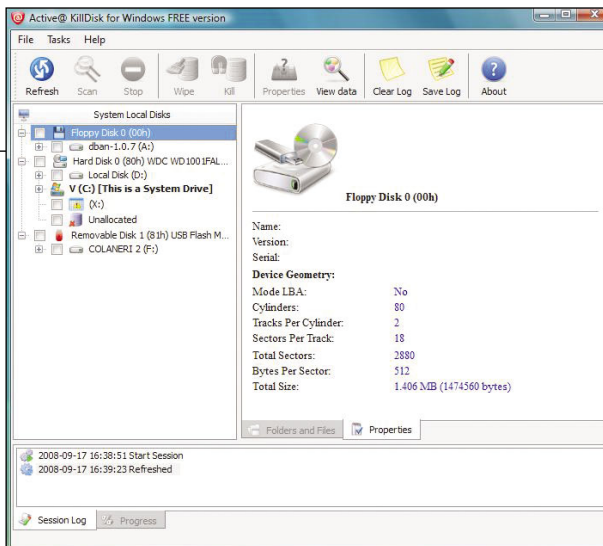
I started with the Windows version. The two main functions of Active Kill Disk are "Wipe" and "Kill." The Wipe function will clean a disk's free space, as well as get rid of unused clusters. This is handy for maintenance purposes. The Kill function is the beast that will actually permanently erase a drive.

The interface is straightforward and displays your session history, all your drives, files, and folders, and information about each when you click it. Choose the data you want eliminated and click Wipe or Kill to do the job. It's that simple.

One rather intriguing feature is the View Data button, which lets you see the random code used to overwrite data. It's beautiful to behold.

The DOS version obviously differs from the Windows version in terms of interface. With some modest instructions from the very helpful user manual, you can either create a bootable floppy disk or a bootable CD. The Active Kill Disk Web site offers a Bootable Floppy Disk Creator, as well as a downloadable ISO image for the CD burn if you need it.

You have three options for using the DOS version of Active Kill Disk: DOS Interactive Mode, which lets you customize the task yourself; Command Line Mode, which requires

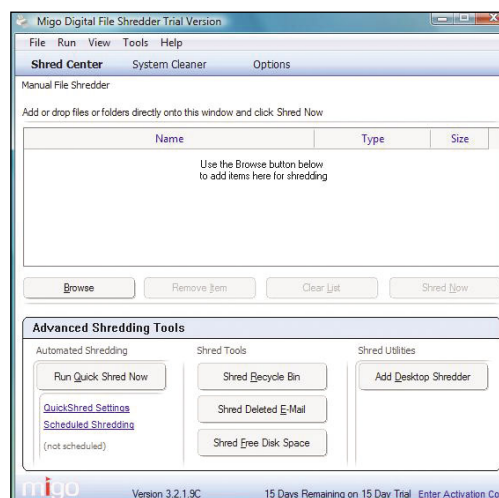


some user skill; or Autoexecute mode, which offers little in the way of customization but requires very few steps. In DOS mode, you can configure Active Kill Disk to Wipe or Kill.

This is a serious piece of software and offers users of any skill level ample methods of data sanitization.

Migo Digital Shredder Premium

Digital Shredder Premium is an application akin to Eraser. It's a Windows-only program that operates within the operating system with an easy-to-navigate GUI that gives lots of options for shredding



Migo Digital Shredder Premium

\$39.99

www.migosoftware.com



data. It boasts standards beyond those of even the DoD.

Like Eraser, you can schedule and customize regular data cleanings, and you can also customize settings for a "Quick-Shred." When you launch Digital Shredder, you can just click QuickShred and the software will perform preset maintenance. This is useful if you don't want to mess with scheduled data sanitization but want the option of an easy solution.

To use Digital Shredder, just launch the application, click Browse, add a file or folder, and click Shred Now. Boom, no more file.

You can select one of four levels of shred severity. Unlike DBAN, which lets you select from several methods of sanitization, as well as (in some cases) the number of passes you want to perform, Digital Shredder simply lets you set the number of passes. It's a little weak comparatively, but to be fair, Level 2 of 4 is the DoD standard.

Other features include a handful of Shred Tools that let you in turn sanitize your Recycle Bin, deleted email, and free drive space. Finally, the System Cleaner lets you select any or all temporary files and unused drive space throughout your whole system to clean in one fell swoop. So rather than selecting files and folders individually (not to mention trying to remember every folder that contains temporary files), you can cut a huge swath of sanitized data all at once.

Overkill?

It may seem a bit overkill to erase your data in four or five different ways to ensure that your data is safe from evildoers forever. After all, most of us aren't exactly desirable targets for thieves willing to put the time and effort into undeleting our hard drives. But you never know when that picture of you from your freshman year of college could resurface; for peace of mind, it's a good idea to use a DoD-quality utility when you ditch your hard drive to obliterate that image forever. ▲

by Seth Colaneri

M12D

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750 / 850W



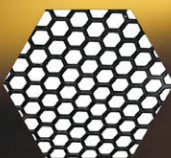
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Digital Support Technology PC Fixer

Few people can fix their PCs quickly when error messages pop up or other issues arise. Even fewer people like paying for tech support. Digital Support Technology's PC Fixer is designed to provide PC help for users who can't help themselves. At times, however, PC Fixer crosses the line into violating the old adage, if it isn't broken, don't fix it.

The purpose of PC Fixer is to scan for, detect, and repair PC issues. Once PC Fixer identifies your problem, it automatically fixes it. If it sounds too good to be

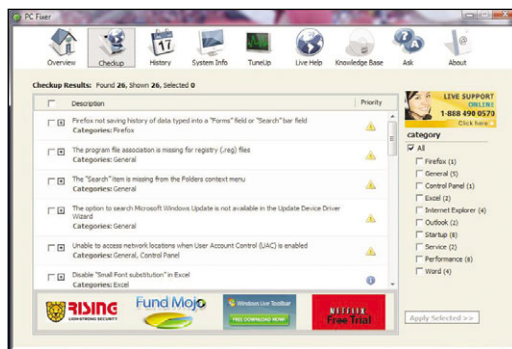
true, it is. While it's nice to have this sort of tool when you are having severe problems, the lack of oversight by a professional can do more harm than good. For example, I found several issues when I scanned my PC with PC Fixer, and it indicated that these issues needed to be addressed immediately. I opted to fix them, and restarted my PC. Later on, I tried to install a new program, and my Windows Installer had quit working because its settings had been tweaked in the process of PC Fixer addressing my issues. I ended up rolling back my PC to the settings from the day before to fix the problem.

The Checkup feature scans for issues on your PC. When it lists the errors it finds, it gives you an

explanation of what isn't working properly and what actions will be taken to fix it. It also lists the severity of the issue, so you can gauge whether or not you need to fix it at the risk of making things worse.

One aspect of the software I found to be helpful was the TuneUp feature. This lets users defrag the hard drive, manage startup programs and Internet Explorer add-ons, and clean up their Registry, although the Registry cleanup is another area where there needs to be some sort of professional guidance. The most useful features of this group are the startup and IE add-on features. They let you disable or enable both startup entries and IE add-ons without having to dig through your PC settings.

If you want live tech support, Digital Support Technology offers per-incident, live remote support for \$19.99. Six months of unlimited live remote support is \$69.99. A full year of unlimited live remote support is \$109.99. ▲



PC Fixer

Free

Digital Support Technology
www.digitalsupporttech.com



by Tessa Breneman

Uniblue DriverScanner 2009

Lots of hardware issues stem from outdated drivers, so it's important to keep them as up-to-date as possible. With Windows Update, however, you don't always get a detailed description of which drivers need updating; thus, you lose some control over the system.

Uniblue's DriverScanner is a very simple, easy-to-use program that alerts you to new drivers, explains what they are, which devices they will affect, and whether or not downloading them is safe or risky.

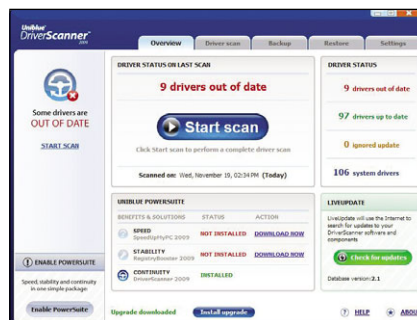
DriverScanner searches your system for missing or outdated drivers as soon as you download or open it and then lets you decide whether you need to install them. You can change the settings, however, and only allow manual scans. DriverScanner has an Overview feature that tells you how many drivers are out-of-date, how many drivers are up-to-date, which updates have been ignored, and

how many drivers are loaded into your computer overall. DriverScanner also supports checking for live updates through the Overview feature.

DriverScanner's log generation tracks your driver download history and the date

of your most recent scan. If you are having an issue with a driver, you can report it to Uniblue through the reporting feature, located under the Driver Scan tab. This is a good way to ensure you are always getting a functional driver downloaded to your system. DriverScanner also includes backup and restore capabilities in case something happens to your hardware.

The best part of DriverScanner is its ease of use. The interface is simple and straightforward enough for even basic computer users to know and understand the risks associated with downloading specific drivers and which of the devices it will affect. The bottom panel of the Driver Scan tab lists all the information about the device affected by the driver update, including its manufacturer, the current version you have, its INF file, and the hardware ID. Armed with this information, a user could (for example) verify whether or not she needs to download a driver labeled as risky. ▲



DriverScanner 2009

\$39.95

Uniblue

www.uniblue.com



by Tessa Breneman

headup 0.9.7.4112

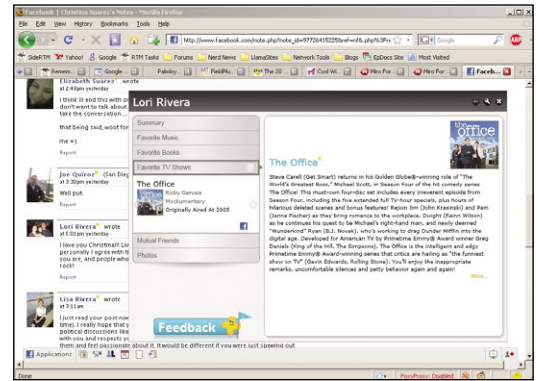
Reviewing new Web services that may be the next great thing only after they reach critical mass is tough. Is the software and/or service good or useful right now? Could it be after it gains wide acceptance? Will the kind or unkind words we say now affect its wide acceptance, making the review a self-fulfilling prophecy?

So it is with headup, a Microsoft Silverlight-powered Firefox plug-in that seeks to directly yet unobtrusively apply the insights and interests of your friends (as they've already been typed into various social networking Web sites) to the Web sites you're already visiting. Coverage seems spotty at the moment, and we wonder if anyone has enough online friends to generate enough meaningful extra content to justify the slowdown our systems experienced with the (admittedly beta-level) headup software installed, but the potential for Something Wonderful is there.

Once installed, headup checks out the social networking and Webmail sites you

already belong to (meaning you need to give headup your logins and passwords to Facebook, Gmail, Twitter, and a few others), and figures out who your online friends are. Then it goes to your friends' public-facing pages in those sites, figuring out where they are, what they like, what music they listen to (for example), and what they're blogging or Twittering about. Finally, when headup sees something in the Web pages you're viewing that relates to something one of your friends has said or done, it adds a yellow + icon in the Web page you can click. Doing so pops up a window with photos, text, and links that headup thinks you'll find interesting.

And it is interesting, though until we get more friends tirelessly blogging about more things, the information headup reveals is generally stuff we already know. In exchange, our Web pages loaded and



scrolled somewhat more slowly than before, though this might be an artifact of beta-grade software. Given time, headup could be the Next Big Thing. But as of this instant, it's hard to say if the extra information it provides is worth the overhead. ▲

by Warren Ernst

headup 0.9.7.4112

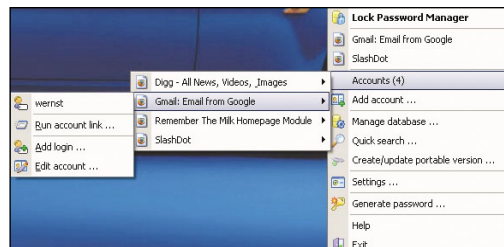
Free
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www.headup.com



Password Keeper 1.0.0.16

We all know that using the same password for all your online accounts is a pretty bad idea, but just writing different ones down on a slip of paper in your wallet is even worse, and typing them out in a Word file or text file (which is easily searchable and copyable) simply takes the cake. The alternative is to remember each and every one of the individually unique passwords you have for the hundreds of accounts and Web sites you use (which is all but impossible), or to employ an encrypted "password locker" program such as Large Software's Password Keeper. Password Keeper keeps all your passwords in an encrypted file, which you unlock with a single master password, and it works with your browsers to automatically fill in fields as you surf. While it has a few neat tricks and unique features, the similarly priced RoboForm Pro does more and with better browser integration.

Working with IE and Firefox, Password Keeper monitors your browser for



login and password fields. The first time it encounters such a site, it offers to remember it for you. The next time you try that site, it automatically enters your login and password and clicks the Login button. This is not only convenient, but it foils keylogging spyware. Unlike the password lists in IE and Firefox, Password Keeper's is encrypted with one of eight encryption methods (AES is the default option) and can be activated either with a master password or a specially prepared flash drive you must insert as a type of digital key, or by the presence of a Bluetooth device such as your cell phone. You

can also prepare a portable version of Password Keeper on any flash drive, allowing for portable passwords on cybercafé computers or notebooks.

While there's no denying it works, PK sometimes feels like a clunky external program you need to interact with, whereas Robo-

Form Pro usually does its similar job almost magically, practically reading your mind and figuring things out on its own. Still, RoboForm's portable version is an extra-cost option, and it lacks Password Keeper's Bluetooth awareness, so in some ways it has RoboForm beat. ▲

by Warren Ernst

Password Keeper 1.0.0.16

\$29.99
NNJ
www.largesoftware.com/html/passwordmanager.html



Dialogue Box

by Chris Pirillo

21st Century Crayons

I first started drawing my own caricature when I was a junior in high school. I'm thankful that I'm still able to replicate the comical nuances of my own face. Sometimes, I'll scratch it down on someone's business card if I really want them to remember me. But that's about as close as I'll ever come to being an artist. Seems that every other caricature I try to draw winds up looking like Abe Vigoda.

What are people like us supposed to do if we need to create

artistic content for a personal or professional endeavor? Do we slave away for months on end trying to develop something worth sharing? We could always commission a work or two, but that's not always practical, timely, or affordable. Thanks to a handful of Web sites and services, we can finally unleash our creative side—with no talent required.

Stick figures aren't very funny on their own, and every geek knows that xkcd (xkcd.com) would be nothing if it weren't for the wit of its creator. So, what if you can't even draw characters of your own? And what if you want to put a bit more personality into those characters? Bop yourself into a strip through Bitstrips (www.bitstrips.com). You can design your own cast of characters or use characters already created by the community. Place objects within a variety of scenes, pose appendages, change facial expressions, add common objects, toss text bubbles throughout; you've made a comic strip. The editor is Flash-based, so it's easy to go back and make minor changes before the image is output as a PNG (which can then be copied locally or uploaded elsewhere). Bitstrips will keep you busy for hours, if not longer.

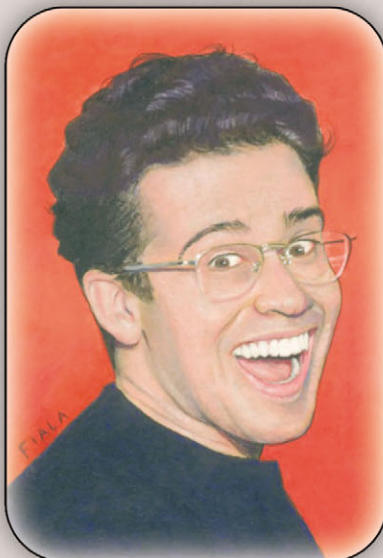
Not since the days of the original NES have I spent wads of free time playing videogames. I realize this is blasphemy to claim in the middle of CPU, but I've already admitted that I'm more of a casual gamer. I enjoy entertainment that I can pick up and put down before developing any sort of addiction. I also loved to create my own videogames on the Commodore 64, thanks to an accessible, object-oriented engine. It's in that spirit I'm pleased to present PlayCrafter.com to you. Create your own Flash-based game and share

it with anybody (anywhere) through embedding into a Web page, blog, social network profile, etc. There are a variety of game types for you to construct. If you like puzzles, create a maze-centric level. If you like cars, why not construct your own wheel-based adventure? If someone likes enough of what you've done but wants to add their own flavor to it, they can quickly remix your effort and build upon it to create something completely new.

Now, I grew up watching "G.I. Joe" and "Transformers" (and "M.A.S.K." and "Thundercats"; the list goes on). I thought about becoming an animator, but my dreams were crushed when I quickly discovered there was little need for Abe Vigoda masters. Should you want to create your own cartoon and don't have the need (or patience) for complicated workflows, check out GoAnimate.com—cartoons in an instant (or a Flash, as that's what drives that service). Either select items from predefined groups or upload your own. If you've always wanted to star in your own animated series, stop waiting for Hollywood to call. Animate yourself!

There's another animation creation station around the corner. This one, however, will let you take anybody else's animation and remix it instantly (I'm sensing this action as a culture trend for new media.) You simply write your script (as simple or complex as you'd like it), then drag scene and character options directly into that text. A single scene may contain several camera angles, as evidenced by my first effort. I wound up pushing "My Secret" directly to YouTube, where it became an instant hit with my subscribers. So, what's my secret? I guess you'll have to see the video to find out.

If you really need to get your creative juices flowing, I advise peeking into Neave.com and losing yourself for a few hours. You'll either love me or hate me for pointing you to it. I'm leaning towards "love," since I've just given you a full set of 21st century crayons (with built-in sharpener). ▲



Chris Pirillo has been doing creative things since birth. He attended several seminars at a local community playhouse as a child. Later, he was offered an art class scholarship after dutifully replicating a book cover for a school project. In high school, he was prone to upstaging his fellow students in stage productions. In college, he decided to hone his writing skills. He's still honing them at chris.pirillo.com, and helping others hone their own skills on lockergnome.com. Chris encourages fellow geeks to follow and share his passions on geeks.pirillo.com, and he's broadcasting live video out of his home office 24/7 at live.pirillo.com. When his life is over, then dead.pirillo.com will launch and creep out half the galaxy.

You can dialogue with Chris at
chris@cpumag.com



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Just Wait For Instant On

There's been a lot of news lately about fast booting. First, it turns out Linux boots pretty fast if you tweak it right. And it turns out, after doing market research into how fast "instant on" must be for consumers to accept it as "instant," Microsoft announced that Windows 7 will boot in 15 seconds. Won't that be something!

It's not that Linux hibernate doesn't work as well as Microsoft's and Apple's versions (because it really doesn't) but rather because "instant on" really is more important. "Instant on" solves the problem that hibernate/sleep/standby were kludged together for in the first place: how to reduce system power consumption without forcing users to go through a lengthy boot/shutdown sequence. If you have "instant on," you don't need hibernate or sleep modes.

Let's start with fast Linux booting. I can get to "easy mode" on my Asus Eee PC in less than 30 seconds. That's pretty pathetic. For example, two Intel developers/Linux kernel hackers, Arjan van de Ven and Auke Kok, presented "From Naught to Sixty in 5 Seconds" last September at the Linux Plumbers Conference (linux.plumbersconf.org). They showed Linux booting in five seconds on their Eee PC.

And five seconds looks pretty sad compared to "Warp!!2", the three-second embedded Linux quick start solution from Japanese embedded Linux vendor Lineo (www.lineo.co.jp). Similarly, many netbooks are now shipping with Splashtop (splashtop.com), a stripped-down, commercial version of Linux installed in motherboard flash ROM. Splashtop reportedly boots in as little as five seconds, but with just a handful of network apps.

How do they do it? More to the point, how can you do it?

First, you need to be selective about what you allow to happen at boot time. Do you really need to start sendmail every time you boot? Kok and van de Ven dispense with sendmail, splash screens, and

other programs that usually load during boot but just don't make sense for most users. They also tweaked the kernel to speed up the way systems are initialized, as well as tracked which disk blocks need to be accessed at boot time. Even more tweaking was necessary to speed up loading X.

Kok and van de Ven have already published their source code, but you may want to wait until it's incorporated into mainstream distributions to get extremely fast booting. In the meantime, simply reevaluating what happens at boot time could easily shave seconds here and there. Their Eee PC booted super-fast, courtesy of its solid-state drive; a Thinkpad took twice as long, as a result of its slower-to-start hard drive.

For really fast booting, Lineo and Splashtop speed the boot process by integrating their code into flash storage on the hardware. Splashtop-enabled netbooks have been announced from Asus, VoodooPC, and Lenovo; Lineo hasn't announced any "Warp!!2" products, yet, but expect these systems to roll out in Japan before they hit North America.

So, the easiest way to get that fast boot is to buy a fast-booting Linux netbook. Eventually, we'll start seeing other instant-on Linux devices (for example, mobile phones in the not-too-distant future), but for now just be patient and drink your coffee.

I suppose you can also wait for Windows 7, because Microsoft has promised 15-second booting. Of course, that means you have to believe Microsoft will follow through on those promises, which means ignoring all those other promises they've made about fast booting, like this one from September 2005: "A Windows Vista computer starts and shuts down as quickly and reliably as a television, typically within two to three seconds." ▲



Peter Loshin publishes LinuxCookbook.com, a place to learn even more about Linux. And don't forget to check out the new Ninitata.com, Peter's family-friendly fun and learning site.

You can get saucy with Peter at pete@cpumag.com

This Search Will Be Televised

The Technology Behind Video Search

Video viewing online has advanced in recent years by leaps and bounds, even if some of the underlying technologies for finding all of this footage have not. In July 2008, U.S. viewers watched 558 million hours of video, or 11.4 billion clips, according to comScore. Still, even after the major networks poured primetime shows online and video sites such as Break.com emerged on the market, Google's YouTube dominates the scene. More than 44% of all videos viewed online in July were on YouTube, while MySpace owner Fox Interactive Media trailed as the next nearest competitor at 3.9%. In other words, most video searching and viewing still occurs in one spot and relies more on user-made tags and content recommendation links than pure search algorithms. Most YouTube searching

uses the tags and video headlines to ferret out the right content from a query. It was only in July 2008 that Google added speech recognition to a limited selection of political content so that it could transcribe and index video by the words spoken in the footage. Video viewing clearly has vaulted into the 21st century, but have the search technologies around that experience advanced as quickly?

No Silver Bullet

Video search results vary so vastly in quality and type because the problem of finding and indexing the ever-expanding catalogs of full-motion content on the Web is hardly straightforward. Querying "last night's Jay Leno" stymies Google Video. We found gossip clips about Britney Spears and a home-made recording of a TV playing an ancient Leno bit. Few search engines drill into the visual content of clips, so most algorithms characterize a video by the metatags associated with it, the context surrounding it, or some basic visual characteristic. "No one idea is good enough," says Suranga Chandratillake, CEO of Blinkx, which boasts 26 million hours of video in its index, powering 5 million daily queries. "People are

always looking for the silver bullet, and there appears not to be a silver bullet in video." The content is so complex and diverse that companies such as Blinkx, AOL's Truveo, and video syndicator ClipBlast have spent years developing technologies that catalog video in multiple ways in order to render credible search results. These companies now use a combination of metatag indexing, cross-indexing with third-party databases, speech recognition, and contextual analysis to decipher video content. But even with more sophisticated combined arms strategies, the results can be fuzzy, at best.

But companies first have to find the video, and crawling a Web now exploding with content is itself a major undertaking. Because video is embedded in Javascript and Flash players, finding footage takes special methods. "We use visual crawling techniques similar to the way a human would look at the Web," says Peter Kocks, president, Truveo,



Google's YouTube only recently started employing speech recognition technologies to index actual words in a very select group of political videos.

which powers video search on AOL, Microsoft Windows Media, and 16 major portals. A bot clicks page links, detects multiple videos on a page, and reads titles and descriptors. Blinkx has what Chandratillake describes as a “digital couch potato,” an automated browser that actually plays the video in its page to understand the context of the content, as well as any links to other sections of a TV episode. The high cost of hosting video means that, unlike text and images, the content often comes on- and offline very quickly, so engines such as Truveo and Blinkx have to prioritize their spidering regimens. And because so much of the video Web now involves sharing, Chandratillake says he has to keep a close eye on emerging user-generated trends. “We see a video is being uploaded a lot, and that is a sign it is going viral.”

The indexing techniques applied to video content are diverse, and each engine cooks its own special sauce. For Blinkx, a combination of text data, sounds, and visual aspects determine the ways a clip is categorized. Determining the video type (music video, TV episode, news story, etc.) is critical to the process, because from there Blinkx knows which indexing tools to employ. For a music video or TV episode, for instance, visual analysis helps tag the scene as a certain entertainment type, but analyzing the speech within it might be useless. In this case, cross-referencing the tune or the episode with a lyrics database or the IMDb (Internet Movie Database) will pull in richer metadata that deepens an engine’s understanding of a clip. For a political speech or news clips, however, the engine might analyze the closed captioning text or apply speech analysis. Much of video search actually relies on phonetic speech engines. “It takes the speech track and breaks it down to phonemes, syllabic noises, rather than words,” says Chandratillake. We store those phonemes so when you do a search for “Sarah Palin” it matches the query against the phonemes, which is more discrete than speech-to-text.” In some select cases with sports clips and financial news content, engines can do optical

character recognition of the clip to detect numbers and text in the video scene.

One important new area for determining the relevance of a video to a search query is its social aspects, says Kocks. How popular a video is with certain groups of people or for a region or a country is becoming increasingly important to prioritizing video search results. Truveo just completed 16 international portal launches. Their research showed that searchers from various countries intended to find different results, and

that now informs how the engine indexes and prioritizes clips in each context.

Of Thumbnails & False Positives

Veteran video hunters such as Kocks, Chandratillake, and ClipBlast’s Gary Baker (see the “Video Search Is A Misnomer” sidebar) found that many approaches to video indexing turn out to be unwieldy. Using speech recognition to index the content of a video clip sounds like a natural technique, but it is overwhelming and often inaccurate in

“Video Search Is A Misnomer”

Accurately spidering and indexing full-motion data is just the first part of the challenge for video search, says ClipBlast CEO Gary Baker. His company syndicates video search to blogs, social networks, and third-party Web sites. Compared to a typical text query, people search video differently, and they expect a very different experience as a result.

CPU: ClipBlast emphasizes branded media content rather than user-generated material, correct?

Baker: The idea is to have over 5,000 professional and prosumer content providers. We are primarily focused on [this content] simply because we think that is where consumers are interested in spending more time.

CPU: You don’t think people search for video the same way they search for text. It isn’t just about getting the most video hits from everyone online?

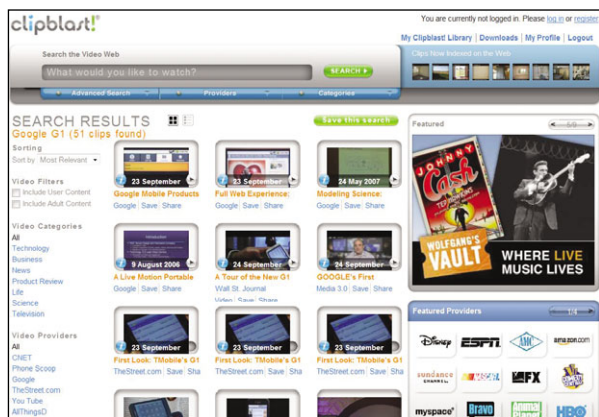
Baker: ClipBlast has always been focused more on the multimedia experience and giving users the sense that it is about the media. We were one of the first to recognize it isn’t search for search’s sake. Users search video as a point of departure and find themselves watching, browsing, and saving clips. They ask to be updated for new material. They recognize how vast the video Web is becoming, so ClipBlast has always found itself hitting this important point of turning the video Web into a very organized type of tool to truly engage you.

CPU: So the future of the video Web is not necessarily in better algorithms and techniques for finding material?

Baker: Facial recognition and speech-to-text is all about getting greater metadata, but realizing that it is all about providing the Web experience is where the focus really needs to be. I am committed to the best metadata that is possible and great algorithms to get the right video at the moment of truth. But there is still much more that the user is going to demand in their use cases. Focusing on video search is one piece to the car engine.

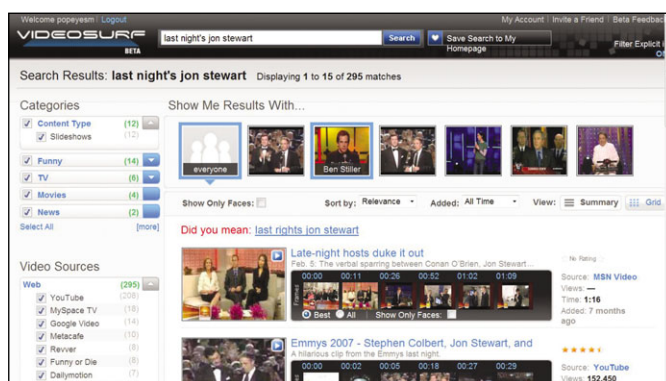
CPU: Where do you see the future of video search, then?

Baker: I think video search is a misnomer. My experience with the video Web and where we design from is that I sit with my device and I want the ability to have video come to me based on my personal use and interests. That is a different answer to what video search is going to evolve to. Video search is one component of browsing video and getting video that is intuitive based on my desire. That is where we see the video Web going to. Getting the tools to the point where the user is filled with the experience is where we want to go. And we want to help the video content providers get to those people.



Most video searchers browse laterally in the results, so providers like ClipBlast optimize the opportunities to discover other sources of content.

Still in an early beta, VideoSurf recently attracted expert accolades for its ability to categorize the visual elements in some clips and let users find key scenes.



practice. "If President Bush gives a State of the Union address, he never comes up and says 'I am George Bush' or 'this is a State of the Union speech,' but those are the most important words so far as search goes," says Kocks. Indexing every word in video content simply leads to a monstrous database of words without other contextual clues to guide an engine in determining its relevance to a search. "The video looks like spam, because you will have hits on almost every word," says Kocks. Some may argue that facial recognition will render more accurate results by looking into a clip and indexing it by actors or politicians. Well, yes, says Chandratillake, but most video with known celebrities and politicians already comes metatagged as such anyway.

These companies argue that the delivery of informative results pages is at least as difficult as the search technology itself. Thumbnails are important to a results page, but finding the right frame to represent a video's content is tough to do automatically. "Thumbnails are a black art and reasonably proprietary," says

Kocks. Truveo must find ways to find a frame that is beyond the blank leader or preroll ad for a screen grab that embodies the scene and also scales well in a small image. And most video search providers say that, unlike a text search, video searches usually are starting points for browsing. Most of us don't refine these searches the way we do with text content. We browse the result set. And so Blinkx, for instance, gives users results in clickable carousels that are categorized by relevance, popularity, and content type.

Coming Attractions

Until recently, video search was not "visual search," in that the indexing engines couldn't analyze scenes and characters in a clip with the kind of detail a text engine reads and categorizes words. As we went to press, however, the VideoSurf engine came out of a private beta. This visual search engine purports to use a proprietary "multigrid fast computation" analysis to extract from the visual information characters and key moments. Longtime search guru and executive editor of SearchEngineLand,

Chris Sherman, recently called VideoSurf "genuinely radical new video search." While still indexing a limited range of content and in very early beta stages, the engine does seem able to index according to actors within scenes and display the results in a filmstrip of "unique moments" in a clip.

But just as each of the major video search providers pursues somewhat different strategies for presenting the video experience, they also ponder various prospects for the technology. Chandratillake thinks that object recognition technologies are far off but promising, because then an engine will be able to distinguish visually dogs from cats or Minis from Ferraris. Kocks believes that sheer scale is the biggest obstacle facing video search. "The question isn't how to do speech-to-text or facial recognition," he says. "The question is how to apply it across a large data set, which is critical to success." ▲

by Steve Smith

Infinite Loop

San Francisco Wants To Plug In Your Car

Leaders in the San Francisco bay-area have agreed on a \$1 billion plan to set up car-charging stations around the vicinity to promote the use of electric cars. The mayors of San Francisco, San Jose, and Oakland reached a deal with Better Place to set up the charging stations. The company also plans to set up battery-swapping centers for electric cars that are compatible with a mechanized battery-changing system. Welcome to the new green economy. ▲

www.sfbay.com/14/story/1415074.html

The Department Of Stuff

by Rob "CmdrTaco" Malda

TV.txt

The latest patch to Microsoft's Xbox 360 includes another piece of technology that takes us one step closer to the end of traditional television: Netflix on Demand is now transparently built-in to every Xbox that is patched up-to-date.

Netflix on Demand has always been a "close but not quite" alternative to cable, but previously it was limited to a dedicated box or your computer. The former is an expensive solution and requires more wires and electrical outlets behind your TV. Watching TV on your computer has its place, but it's tough to cuddle on the couch in front of that 19-inch screen. The Xbox 360 is already installed in far more homes than any of the proprietary video-on-demand boxes out there—including Amazon and Netflix's own offerings.

There are a number of problems with Netflix on Demand: While Netflix on Demand's standard-definition programming is comparable in video quality to most cable networks, anyone who has grown accustomed to hi-def programming will be disappointed with the picture quality. Of course, as anyone with DirecTV or Comcast knows all too well, the pressure to increase the raw number of channels has resulted in overly compressed video signals that look comically poor. What consumers really want (apparently) is 200 more channels they won't ever watch at the cost of compressing the 20 most popular channels so much that they become pixelated messes on a TV that's more than 21 inches wide.

Netflix's selling point has always been that it's cheap. For \$20 per month you can watch episodes of countless old TV shows forever. Of course the key word here is "old." If I want to watch last night's episode of "House" on Fox, there's no help for me here. Netflix on Demand has a nice collection of content, but it's far from complete. TV shows require you to wait months to be released on DVD, and many movies in Netflix's library simply aren't available through the on-demand service. Presumably this is because of complex contractual arrangements with those who

hold the rights to the shows. But as the technology shows users how preferable this method for watching TV is, it seems inevitable that consumers will eventually demand it.

An alternative is iTunes. But the price structure for purchasing individual TV episodes is absolutely ludicrous. To expect your audience to pay \$2 to \$3 per episode of a high-def show is comical: A cable bill with every premium channel might run you

around \$100 per month. If you watch two shows a night, it would cost you more to watch those shows using iTunes than with a standard cable or satellite service. And since you are purchasing every show individually, you don't get access to the wonderful TiVo season pass function that grants you limitless episodes of random reruns of "Seinfeld" and "The Simpsons" to watch before bed.

If you really want to use iTunes to watch TV, you once again have to tether your laptop to your PC, build a media PC, or else purchase the very overpriced Apple TV. The genius of the Xbox/Netflix deal is that it just works and with a box that every Halo-playing household in America already has.

Network TV has to be shaking. TiVo taught readers the glory of the PVR, but it did so with only a tiny cache of recently aired programming. Netflix on Demand lets the user reach back into the archives to gain access to arbitrary episodes of specific shows from back in time. And putting it all onto the Xbox 360 makes it simple and easy.

The next steps seem clear: faster turnaround on content would be wonderful, but I suspect the industry will want us to pay a premium to see content the day of release. But perhaps partnerships with TiVo or Sony could get the service into more homes. Or maybe Apple and Netflix could simply partner up and end it all. It could happen. But it probably won't. ▲



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

Contact me at malda@cpumag.com

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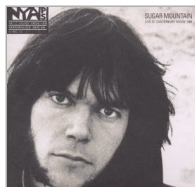


At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

Audio Video Corner

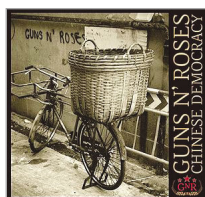
by Blaine A. Flamig



\$14.99
Reprise Records
www.neilyoung.com

"Sugar Mountain-Live At Canterbury House 1968"—Neil Young

Weeks prior to Neil Young's self-titled debut solo album and shortly after leaving Buffalo Springfield, Young took the stage at the Canterbury House in Anne Arbor, Mich., for a show so unguarded and intimate, the recording now available as "Sugar Mountain" listens as if Young is playing in your living room. This is Young before he was a star and brimming with confidence and security in his songwriting and talent. Released as the third installment in what is already an exceptional "Archives" series, "Canterbury" draws upon Young's work in Buffalo Springfield ("Mr. Soul" included) while also hinting at the mastery that was to come ("The Old Laughing Lady," "Sugar Mountain," etc.). Soulful, sweet, and vulnerable, "Canterbury" is a snapshot of a master starting his journey.



\$11.99
Geffen
www.gunsnroses.com

"Chinese Democracy"—Guns N' Roses

Maybe fans' expectations after 1987's "Appetite for Destruction," arguably rock's best debut ever, was too much for any band to live up to, and maybe Axl Rose realized this before anyone. If so, GNR's transformation from "Appetite's" raunchy, blues-based swagger to 1991's "Use Your Illusion" and the all-too-similar "Chinese Democracy's" bombastic, self-indulgent melodrama all makes sense. Like "Illusion," "Chinese Democracy," 14 notorious years in the making, demonstrates that Axl still lives in Axl's own world. If you like the scenery, "Chinese Democracy" is an unmitigated success, as the 14 tracks are fueled on familiar Rose themes (bitterness, loneliness, and paranoia). For those less enamored with all things Axl, "Chinese Democracy's" insanely over-worked tracks are intriguing but cold and void of intimacy.



\$26.99
Universal Studios
www.wantedmovie.com

Wanted

Mix elements of antihero Tyler Durden with Neo's newfound abilities to kick tail in the name of justice and you get Russian director Timur Bekmambetov's high-octane, bullet-bending, Angelina Jolie-tattoo-baring "Wanted." After another unsatisfying "Who am I" day of accountant cube-dwelling, young Wesley Gibson's (James McAvoy) life changes forever when Fox (Jolie) saves him from an apparent attempt on his life by a hit man named Cross. After Fox, Sloan (a nasty Morgan Freeman), and other members of the ancient Fraternity, a league of assassins, transforms Wesley into a killing machine, he sets out to kill Cross, a rogue Fraternity agent who killed his father, also a Fraternity member. But all isn't what it appears. Though "Wanted" doesn't hit on all cylinders, it's brilliant popcorn mayhem that always entertains.



\$16.99
Sony Pictures
www.stepbrothers-movie.com

Step Brothers

Cinematic history is littered with legendary comedic duos: Crosby and Hope, Martin and Lewis, Laurel and Hardy, Abbott and Costello, Cheech and Chong, and so on. We're not quite ready to add Ferrell and Reilly to that list, but if there was a Comedic Hall of Debauchery, the duo would be a lock to enter. If the nonsensical, scatterbrained hijacks the Shake & Bake team provided in "Talladega Nights: The Ballad of Ricky Bobby" flipped your wig, the far lower and cruder "Step Brothers" will leave you bald. As Brennan and Dale, two 40ish ultra-slackers brought together when their parents marry, Ferrell and Reilly have no boundaries where good taste is concerned, which is a good thing if that's your thing. Throw in scene-stealing Adam Scott as Brennan's mega-successful younger brother Derek and surprisingly nasty turns from pros Mary Steenburgen and Richard Jenkins and "Step Brothers" is a laugh-out-loud guilty pleasure.

DVD Byte

2/3

Bottle Shock
Nick & Norah's
Infinite Playlist
Soul Men

2/10

Blindness



Miracle At St.
Anna
My Name Is
Bruce

2/17

Body Of Lies
Flash Of Genius
Religulous

2/24

Breaking Bad:
The Complete
First Season
The Librarian:
The Curse Of The
Judas Chalice
Extreme Movie

See the full reviews from A/V Corner at www.cputmag.com/cputfeb09/AYL



GEARS OF WAR 2

At Some Disputed Barricade—by Chris Trumble

You've probably seen the dramatic TV advert for Gears of War 2 featuring the DeVotchKa tune "How it Ends." The scene depicts Marcus Fenix and his fellow Gears rising from a few brief moments of rest to pack into tiny pods that will drill down through the surface of planet Sera, hurling them into the midst of the great Locust horde. The scene and the music intertwine to create a palpable sense of desperate resignation; as we watch, you and I know immediately that these men expect this to be a one-way ride.

The ad does its work; it conveys the tone the game sets from the moment it takes over your screen. The lightmass bomb you detonated deep within the Locust caves at the end of the first game failed to wipe the Locust out, and now they are stronger than ever. Humanity has repeatedly fallen back in the face of an unstoppable Locust onslaught, and now mankind has but one safe haven left on all of Sera, so rather than sitting back and waiting for the inevitable coup de grace, the remaining COG forces are launching one final, desperate offensive in an attempt to stamp out the Locust threat where it lives.

Granted, the first game didn't reach its potential where the story was concerned, but this game is different from the start. The soldiers fighting the Locust know the price of failure will be the extinction of their species, and the team at Epic took considerable pains

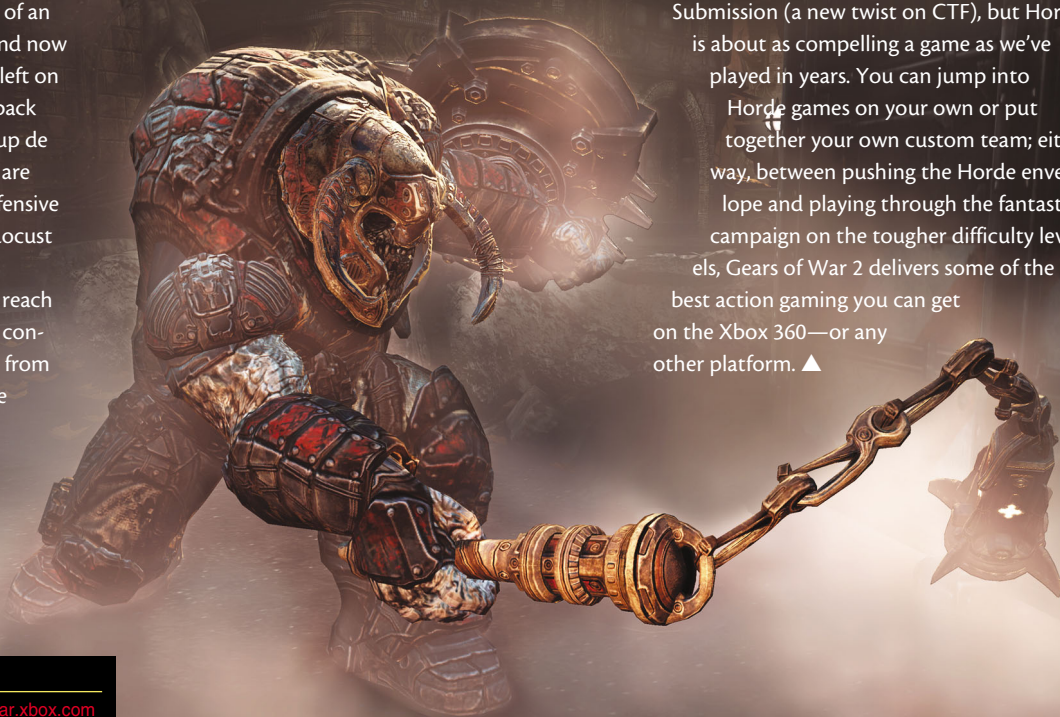
to show that the casualties have become personal. Ultimately, there are still a few details that could have been fleshed out more extensively, but story fans will generally find GoW2 more fulfilling than its predecessor.

In terms of gameplay, Epic clearly didn't feel the need to make drastic changes (if it ain't broke...), and we're quite happy with this decision. The control scheme introduced in the first GoW was a great fit for the third-person action the game served up, and that hasn't changed. Instead of change for change's sake, the devs at Epic bolstered the game's array of available weapons, introduced cool new enemy units, and refined its level design and pacing.

As much as we like the campaign, one of the biggest developments for

GoW2 is the inclusion of some great new multiplayer modes, most notably the excellent PvE Horde mode. Horde pits you and up to four other players via XBL matchmaking against a series of waves of Locust forces, each one bigger and more intense than the last. Initial waves consist of basic Locust enemies that pretty much throw themselves at you, but as you progress the game sends higher-powered enemy types that use increasingly sophisticated tactics. The concept sounds simple—and it is, really—but Horde is one of those gaming experiences that will have you telling yourself and your teammates, "Just one more game, we almost got through that last wave," until you finally notice the hours that have passed and force yourself to sign off.

The Wingman mode, a two-player team survival deathmatch mode, is also very cool, as is Submission (a new twist on CTF), but Horde is about as compelling a game as we've played in years. You can jump into Horde games on your own or put together your own custom team; either way, between pushing the Horde envelope and playing through the fantastic campaign on the tougher difficulty levels, Gears of War 2 delivers some of the best action gaming you can get on the Xbox 360—or any other platform. ▲



\$59.99 (360) • ESRB: (M)ature

Microsoft Game Studios • gearsofwar.xbox.com



FABLE II

Let Your Moral Compass Be Your Guide—by Dr. Malaprop

\$59.99 (360) • ESRB: (M)ature • Microsoft • www.xbox.com/fable2

This sequel to the 2004 light-hearted fantasy RPG is set in Albion 500 years after the original with an all-new narrative. You

begin as a child with your older sister in Bowerstone Old Town

doing a few odd jobs to raise funds. Alas, things

take a turn for the worse after an encounter with

Lord Lucien, and your quest begins.

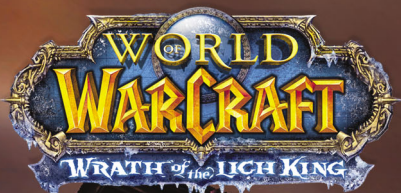
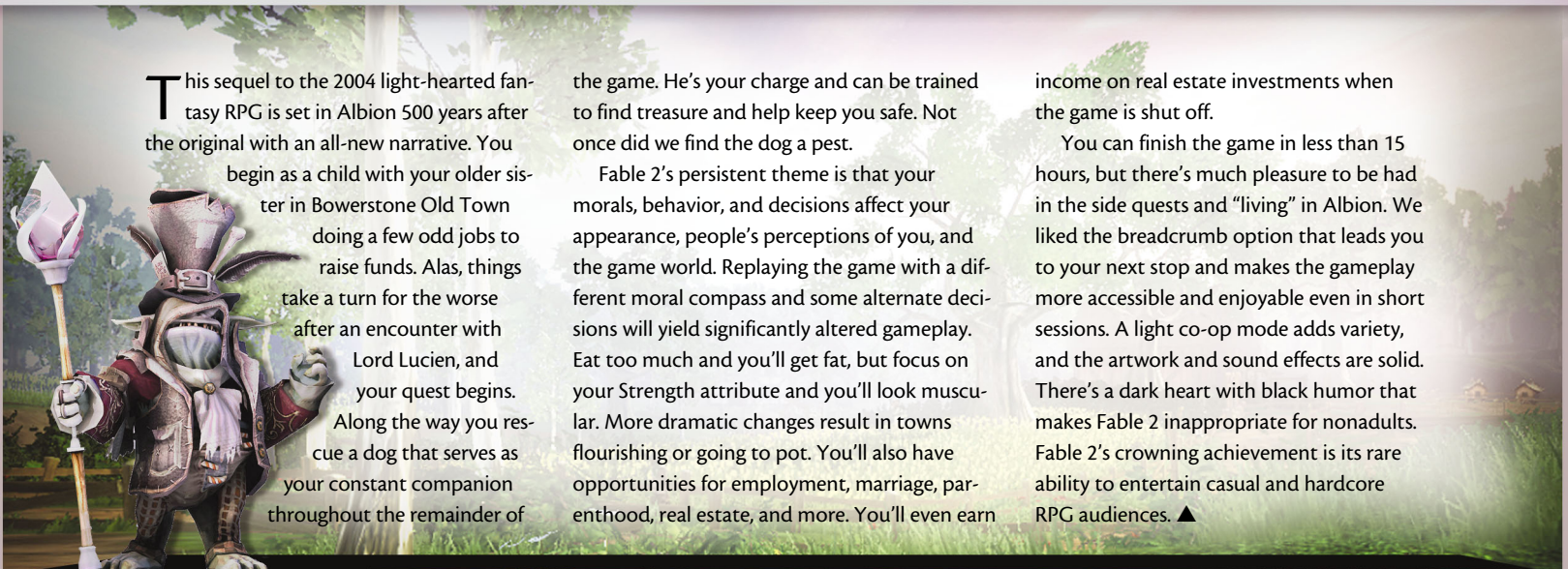
Along the way you rescue a dog that serves as your constant companion throughout the remainder of

the game. He's your charge and can be trained to find treasure and help keep you safe. Not once did we find the dog a pest.

Fable 2's persistent theme is that your morals, behavior, and decisions affect your appearance, people's perceptions of you, and the game world. Replaying the game with a different moral compass and some alternate decisions will yield significantly altered gameplay. Eat too much and you'll get fat, but focus on your Strength attribute and you'll look muscular. More dramatic changes result in towns flourishing or going to pot. You'll also have opportunities for employment, marriage, parenthood, real estate, and more. You'll even earn

income on real estate investments when the game is shut off.

You can finish the game in less than 15 hours, but there's much pleasure to be had in the side quests and "living" in Albion. We liked the breadcrumb option that leads you to your next stop and makes the gameplay more accessible and enjoyable even in short sessions. A light co-op mode adds variety, and the artwork and sound effects are solid. There's a dark heart with black humor that makes Fable 2 inappropriate for nonadults. Fable 2's crowning achievement is its rare ability to entertain casual and hardcore RPG audiences. ▲



Blizzard Tales Down The Velvet Rope—by Chris Trumble

\$39.99 (PC/Mac) • ESRB: (T)een

Blizzard Entertainment • www.worldofwarcraft.com

After spending time with the newest World of Warcraft expansion, Wrath of the Lich King, we could easily fill a page or three raving about the new zones, instances, mob types, and mounts, for instance, and we could talk about the inviting visuals and the stirring new musical scores. In just about every way, Wrath is a big improvement over The Burning Crusade and the original content. And having a whole new continent of surprises and first-time experiences is a real boon for anyone who's been playing for a year or more.

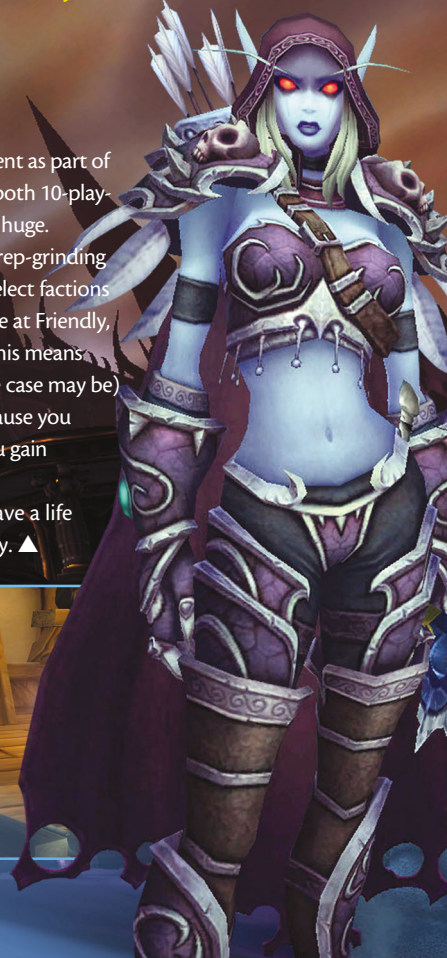
Having said that, Wrath's biggest improvement comes not in the area of flashy events or well-crafted instances, but rather in its accessibility. Let's face it, when you reach a milestone like 12 million subscribers, it is no longer reasonable to assume that a large portion of your customers are hardcore, five-night-a-week raiders. Based on Wrath, it's clear that Blizzard gets this.

The biggest, most obvious example of this is the fact that Wrath's raid instances now accept both 10-man and 25-man raid groups. Yes, if you want to achieve everything and have a shot at the absolute best gear in the game, you need to clear the raid instances' 25-man settings, but if you can't or don't want to invest that kind of

time and effort, you can still see all of the new content as part of a 10-person raid. Anyone who's ever spent time in both 10-player and 25-player raids knows the difference, and it's huge.

Another big accessibility refinement is the new rep-grinding system that lets you gain reputation points from select factions simply by wearing their tabards (which are available at Friendly, rather than Exalted) in several level-80 instances. This means that you don't have to spend hours (or days, as the case may be) slogging through dungeons you don't like just because you need one item a faction offers as a reward once you gain Exalted status.

In short, you can enjoy all of Wrath and still have a life now. Which is good, because there's a lot to enjoy. ▲



COMMAND & CONQUER™ RED ALERT 3

Comedic Presentation & Strategic Satisfaction

—by Dr. Malaprop

What would happen if the Soviets went back in time to create an alternate future by assassinating Einstein before his work led to the atomic bomb? You'll find out as the three factions battle in this 27-mission campaign. The intentionally ham-fisted FMV creates the story with the Soviets, Allies, and Land Of The Rising Sun represented by Tim Curry, Jonathan Pryce, and George Takei, respectively. Others you are bound to recognize include Jenny McCarthy as Tanya. It's not often games feature armored bears on parachute drops; RA3 is the exception. Unit types are as equally irreverent as the FMV. Factions offer plenty of unit variety to hold your attention across the challenging land, sea, and air skirmishes.

Controls are expectedly spot-on for the PC with the 360 receiving refinements over EA's prior RTS releases, such as the prior Command & Conquer or

Lord Of The Rings. Unit movement and building management with the 360 controller was comfortable with ample shortcuts to useful commands. We've been impressed with how EA has made a console strategy game control. And RA3 is comfortable on the console the same way Take2's Civilization: Revolution was.

The overall gameplay experience you'll be having on the 360 is essentially identical to the PC, but you may need a couple of hours to get comfortable with the controller. The PC supports six players competitively compared to four on the 360, and the welcome co-op mode lets you play the campaign with another player. RA3 isn't revolutionary, nor does it allow us to zoom as far away as we'd like to see more on-screen units, but those are minor nitpicks for the excellent real-time strategy gameplay and good dose of laughs. ▲

\$49.99 (PC); \$59.99 (360) • ESRB: (T)een

Electronic Arts • www.commandandconquer.com



FALLOUT 3

Post-Nuclear Oblivion—by Dr. Malaprop

If Interplay's Wasteland (1988) and its spiritual successors, Fallout 1 and 2, were games that you consumed with passion, then breathe deeply, strap on your PIP-Boy 3000 wrist computer, and step into post-apocalyptic Washington, D.C., circa 2277. The game takes place 30 years after Fallout 2 and eschews the isometric viewpoint of the prior games for a first third-person view. Humor still lives in the design but feels more muted.

The game begins with your birth in the Vault 101. Your progression to adulthood allows you to craft your character in-game prior

to leaving the nuclear shelter. Upon emerging from the vault you are greeted with a spectacular view of the surface devastation. That experience is similar to what happened in Oblivion upon leaving the dungeons. Similarities to Oblivion abound, but not in a way that makes you feel Bethesda took shortcuts.

Your primary quest to uncover what happened to your father can be completed in less than 25 hours, but side quests lead into more than 100 hours of gameplay should you choose to explore the wastelands. The FPS-looking combat is actually based on stats, so missing at close range shouldn't be surprising.

Combat felt most rewarding when using the V.A.T.S. system to pinpoint specific enemy body parts to attack coupled with gruesome animations. Most quests are non-linear and can be completed in different ways.

We liked the noninvasive disc-check and abstinence from onerous DRM schemes on the PC. The console game looked spectacular on our big-screen TV and felt natural with the Xbox controller. The in-game wrist computer interface, however, felt unintuitive; hotkeys would have been a welcome alternative. Fallout 3 is easily one of the best games of 2008 and deserves to be on any serious gamer's playlist. ▲

\$49.99 (PC); \$59.99 (360/PS3)

ESRB: (M)ature

Bethesda Softworks

<http://fallout.bethsoft.com>



DEAD SPACE

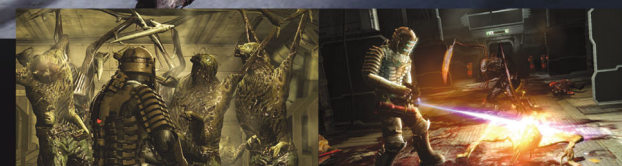
\$59.99 (360/PS3); \$49.99 (PC) • ESRB: (M)ature
Electronic Arts • <http://deadspace.ea.com>

The Sleeper Awakes—by Dr. Malaprop

You play the role of engineer Isaac Clarke, one in a small crew sent to repair the communications aboard a planet-cracker mining ship known as the USG Ishimura. It's a standard mission that goes awry upon your arrival. Isaac gets

separated from the crew and is tasked with repairing and obtaining items needed for an escape. Necromorphs—monstrous permutations of the former Ishimura crew—make that task much harder (and creepier). Blind firing is unwise with ammunition so hard to come by, and Isaac will need to focus on destroying enemies' limbs to take them out and survive. All this leads to tense and occasionally terrifying moments as you race through the game.

Dead Space took us completely off-guard; it's our sleeper hit of 2008. It features a narrative that combines elements from countless sci-fi and horror films, but its high production values, detailed graphics, immersive sound effects, atmospheric audio, and excellent play mechanics elevate Dead Space to the high levels in the genre, falling a hair short of BioShock and Half-Life 2. Turn the lights down, crank up the 5.1, and feel the hair on your arms and neck defy gravity. ▲



A Time To Rock, A Time To Build—by Dr. Malaprop

Guitar Hero World Tour tips its hat to Rock Band by adding drums and microphone to the existing guitar tracks. Use your existing Rock Band instruments or purchase Activision's new hardware bundle; the drums now feature cymbals, and the lead guitar has added a slider on the neck to tap out solos or create wahwah sounds. The 86 master tracks on GHWT sound fantastic. For example, after Metallica's release of "Death Magnetic," people noticed that the sound quality of GHWT's master tracks had superior fidelity than the CD. The 86 tracks are paltry when compared to RB2's 100+ songs (excluding the song import feature for the original Rock

Band). Finally, while both music games support DLS, only RB2 is releasing new music weekly.

The game includes an advanced music studio to craft new music. Unfortunately, it's very complex and is only applicable to advanced users with a strong knowledge of music. Artists such as Ozzy Osbourne, Sting, and Billy Corgan have been motion captured and will confront you on stage. Overall, the two games play similarly, with GHWT partial toward classic rock and heavy metal music while RB2 encompasses a broader range. If you own neither, buy one bundle and the other stand-alone game for the full experience. ▲

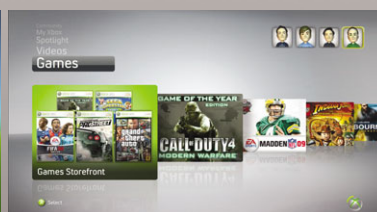
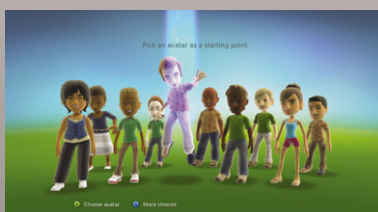
Game Only: \$59.99 (360/PS3/Wii); \$49.99 (PS2/Wii) • ESRB: (T)een
Bundle with game, drums, guitar, & microphone: \$189.99 (360/PS3/Wii)
Activision Blizzard • <http://worldtour.guitarhero.com>

New Xbox Experience

The 360 Reborn—by Dr. Malaprop

The NXE makes you feel like you just set up a brand new game console. Such a dramatic makeover is quite unprecedented in the industry.

The original 360 blade interface is (mostly) gone. Scroll vertically to view primary categories (My Xbox, Video Marketplace, Friends) and then scroll horizontally for associated features for each primary category. For example, you can scroll vertically to the Video Marketplace and then horizontally to Netflix to access and stream your Instant



Queue in HD. Scroll vertically to your Friends list to get custom-created Avatars—which look similar to the Wii's Miis. Pressing the Xbox button on the controller pops-up the Quick Launch Bar (a mini-blade interface). Here you get instant access to the status of your friends, messages, and more. Other new features

Free Update (360)

Microsoft

www.xbox.com/en-US/live/nxe/



include full installation of games to the hard drive, the ability to create a party for private chat, easy jumping between games, and more.

The smooth animation and elegant view is better for navigating content and friendlier for mom, but it doesn't handicap hardcore gamers. Overall, the new experience feels snappy and is an improvement from the original in nearly every way. Bravo. ▲

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www.topower.com



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Patent No. 202005013110.5



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PowerGood LED indicator

- Self-test for normal operation



Mirror-effect coating

- Titanium-like mirror coating.
- Nano technology for shielding EMI.



The Cutting Edge

by Barry Brenesal

Compact Discs

Philips touted the compact disc it developed in the late 1970s as a company effort, rather than as the invention of a single individual. We would go even further and say it was the culmination of several dozen inventions over the last century, such as the pulse code modulation method of audio encoding, developed in 1937 by Alec Reeves, and optical disc technology, patented by David Gregg during the 1960s. One must also consider the shifting cultural conventions, including the shift away from the creation of musical entertainment in 19th-century middle-class American homes toward outside consumption in the 20th century. Philips does get the award for vision and ingenuity in seeing how these various strands could be brought together to create the compact disc, though.

The company also deserves credit for structuring a unified industry approach to the compact disc and its components. Philips was clearly mindful of a few minatory examples of format ideas whose proponents lacked such foresight, including the turntable speed wars of the 1950s, the 1970s' quadraphonic wars, and Sony's doomed attempt to dictate the future of the VCR through the Betamax. Philips' magnanimity led to a series of so-called "color books" throughout the 1980s that would define CD digital audio specifications, the computer CD format, interactive and writeable technologies, and VCDs.

The first CD Philips pressed in its original Hannover plant featured the elderly Herbert von Karajan, chief conductor of the Berlin Philharmonic, who had also appeared at the original press conference announcing the new format. Ironically, as a much younger, extremely ambitious man (and a protégé of Hermann Göring), Karajan made one of the first experimental stereo tape recordings. This was in 1944, several years before magnetic tape would catch on as a favored studio medium and more than a decade before stereo became a *de facto* playback standard.

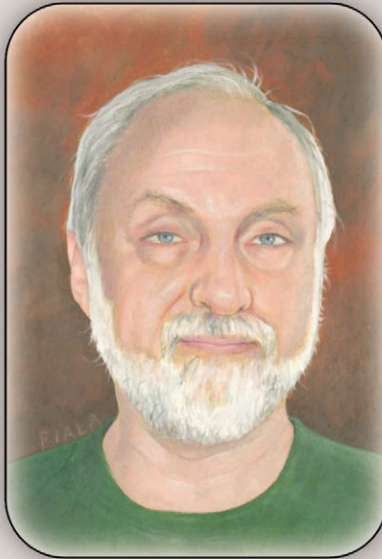
Philips' big plan to make a killing off compact discs both succeeded and failed. The company succeeded in convincing record labels to triple their prices to consumers for the new medium, despite the fact that CDs were actually cheaper to produce than long-playing

records. However, it failed when both the public and broadcasters refused to buy \$1,000 CD players; Philips initially had to give away some of its first-generation units to get radio stations interested in the new medium. During the 1980s, when I was a program director for a classical public radio station in Florida, we got one of the early giveaways. My station manager at the time interrupted our programming, made a long speech announcing the dawn of a new technological era,

and played an organ CD—the only disc we had in house. It promptly got stuck in a groove, creating a delightful impression of a machine gun. Matters improved over the next several years, but until then, the Al Capone effect was heard repeatedly across the length and breadth of the land.

Nor was Philips' 1982 brag that "From now on, the conventional record player is obsolete" perfectly true, either. The CD has taken over as the physical listening medium of the day, but long-playing albums and analog playback equipment have gained a high-end audio market of their own. Although the digital CD plays a sampled portion of sound, the analog reproduction process provides the full sound waveform, identical to that heard by the ear. For some listeners, this produces a difference, and there are currently several hundred smaller but thriving firms manufacturing and selling turntables, pickup cartridges, or tonearms.

As a computer storage medium, however, the CD achieved its greatest and longest-lasting success. Its binary nature and generous 650MB capacity made the CD an obvious replacement for older mechanical disks—using a density standard of 1.44MB by the late 1980s. It took a while for software manufacturers to switch over, but the exponential size increase of applications and games under Windows (thanks in large part to cheap memory) required CDs for feasible storage. The DVD may be nibbling at the edge of this hegemony today, but it's not king of the hill yet. If the cutting edge isn't just a matter of technology, but is one of audience preference, the CD still has it. ▲



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100.

It was last seen functioning as a boat anchor.

Wax nostalgic with Barry at
barry@cpumag.com

Software

Tips & Projects

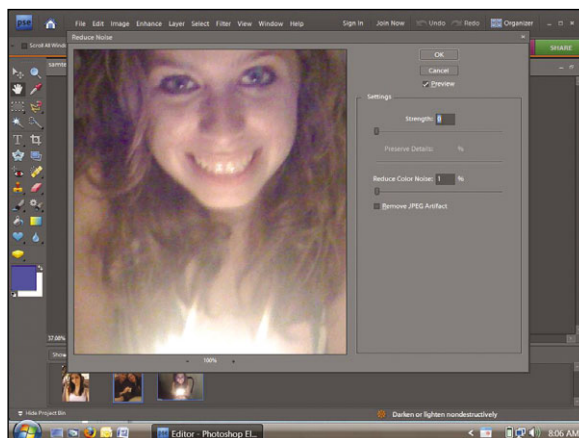
Advanced Tools For Basic Images

The cell phone camera represents a major evolutionary step in photography. Recording instruments are now ubiquitous. Everyone, potentially, is a journalist and a witness to history. As cable newscasts and the libraries of YouTube and Flickr demonstrate, anyone with a contemporary cell phone can record natural disasters, petty and major crimes, or just goofy accidents for all of us to see. The next evolutionary step is to make these grainy, fuzzy, poorly exposed amateur images a bit more palatable. Most phone cams are low-res devices designed to capture images in the most rudimentary ways. We decided to apply to these amateur snapshots some of the tools and tricks the pros use to refine their photos. We may not be able to make your grainy, muddy, RAZR images look as if they came from a D-SLR, but there are ways to sharpen the detail, quiet the noise, and make these captured memories pop.

Cam Basics

Before we get to the digital darkroom itself, keep in mind a few picture-taking tips that apply especially to phones. First, clean your lens before shooting. Most phones sit in lint-coated pockets and accrue a layer of detritus that can soften all your images. Second, get as much light on the subject as possible. Lower light translates into more digital noise or grain. Next, look for a color or white balance

control in your phone. Some recent multimedia models let you set balance to outdoor daylight, indoor incandescent, or indoor fluorescent light. Choosing the right setting in the original shot gives a more color-accurate image to manipulate in editing. Otherwise, your editing software will fight against the green or orange casts in your images that impede our other techniques. Next, fill your viewfinder. Any



Poor lighting conditions produce noisy phone cam results. But advanced tools like the Noise Filters in PhotoShop Elements is the place to start when upgrading a snapshot.

cropping and enlargement we need to do later will only exaggerate the existing defects in the shot.

Remember to get close to the subject when taking the photo. And be sure to steady yourself as best you can. Phone cams do not have fast shutter speeds, and hand shake is the most common reason for blurry cell phone photos. Our instinct is to float our shooting arm in front of us to

compose the shot, and that is the worst way to shoot with these slow cams. Instead, lean that arm against a table or press it firmly against your side and support it. Keep it anchored for a moment after you press the button to account for digital shutter lag. Now, let's hit the darkroom.

Power Tools Cutting Cardboard

You don't need a nuclear reactor to power a bicycle, but a powerful mid-level toolset does wonders on junky images. We used Adobe's new Photoshop Elements 7 (www.adobe.com), a \$99.95 image organizer/editor that shares many digital tools with its big, costly brother, Photoshop CS3/CS4. You will find similar tools in other editors.

Open an image in Photoshop Elements and save it under a different name. For these fixes, we're using advanced tools in a rudimentary way, directly on the image rather than through the layers that a real pro might use. The layers approach would let an editor back out of any changes easily

by turning the adjustment layers on or off. For the sake of brevity, we are making all changes on the original image, so make sure you keep the original and save this edited file under a different name.

We started with a poor quality image that was made by candlelight (birthday candles, in fact). Most poorly exposed phone cam images have lots of noise or visible graininess. Go to the Filter/Noise/Reduce Noise selection to bring up an editing window with several sliders and an enlarged preview window. Start moving the Strength slider to the right to reduce the graininess, which in turn will increase the softness of the image edges. You can

pull up on the Preserve Detail slider to restore some of the detail, but this also restores some noise, so try to strike a good balance. In our experiments, we left the Preserve Detail slider alone so that we could eliminate the most digital noise and then enhance sharpness with more sophisticated tools later. The bottom slider, Reduce Color Noise, affects images that have noise in the form of visible color blotches rather

than overall grain. Only use this slider if you need to eliminate that form of noise, and make that adjustment last. In our tests, eliminating overall noise tended to increase the color blotchiness, but adjusting the bottom slider last helped eliminate it. Click OK when you're finished making adjustments.

By the way, Elements remembers your last settings in this Noise Filter, so bringing later images into this window will apply the same settings.

Another, underutilized trick for reducing noise are blur filters. Go to Filter/Blur/Gaussian Blur. In very small increments, move the slider above the 1.0 pixel mark and keep an eye on both the sharpness in the details as well as the grain in a large expanse of grey or background color such as the sky or a wall. If your image can tolerate a bit of softness, then the Gaussian Blur can smooth out the noise very effectively.

Pop It Up

It's important to reduce noise first because some of the other enhancements we are about to apply to the image (sharpness, contrast, color) will amplify graininess and image errors. Rather than use the standard Sharpness tool to tighten up the detail in our phone cam image, let's use the more versatile Unsharp Mask, found in the Enhance menu. The Radius slider here is as important as the Amount. Radius determines how many pixels around an edge (a



Noise reduction, sharpening, and color curve adjustments have been applied to the left-hand version of the image, which sets it up for saturation and color adjustment.

marked change in color or contrast) will be affected by the Amount slider. Overdoing the Radius setting will bring back a lot of the grain we eliminated earlier, so we settled on between 1.7 and 2.0. Now, bring the Amount slider to the right to clarify detail without adding halo-like artifacts to the edges. Click OK when done.

With noise and sharpness modulated, we can move on to playing with contrast and color. Poorly exposed images also suffer flatness of tone. Again, rather than using the simplest tools for lightening and darkening an image, let's go to the advanced tool set: Enhance/Adjust Color/Adjust Color Curves. Curves adjustments are extremely powerful because they let you target different tonal ranges in the image. Our test image has an overall flatness, so we pulled the Midtone Brightness and Midtone Contrast sliders to the right to

enhance distinctions among the middle range of colors. If you have a murky image where detail is lost in large swathes of underexposed areas, try moving the Adjust Shadows slider to the right. In our test image, the candlelight was so intense that it blew out the center of the image, but this was part of the desired effect. In fact, by increasing the Adjust Highlights portion of the image we brought up the parts of the girl's face that captured that glow.

Now, play with color: Enhance/Adjust Color/Adjust Hue-Saturation. Unless you really know what you're doing, we suggest

leaving the Hue channel alone and enriching the existing colors with the Saturation slider. If there is a particular color in the image, such as cyan, yellow, or magenta, that you want to isolate and bring out, then use the drop-down Edit menu to saturate or desaturate only. Keep in mind that saturation also can make your grain/noise pop back out. So keep an eye on solid expanses of color for signs of noise. ▲

by Steve Smith

Windows Tip Of The Month

As Microsoft and Google compete over ownership of the desktop, a software arms race has erupted. In the latest refresh of Windows Live Web-based services, Microsoft now offers a suite of downloadable programs free. Its Write client is for composing blog entries offline for later publishing to all the major blog platforms. Like Google's Picasa, the Photo Gallery organizes, shares, and edits images. A new Live Mail client pulls messages from multiple Web and Pop3 accounts and even shares contacts with Microsoft Messenger. And a Family Safety tool controls how and when your kids can access the Internet. For beta versions of these and other Live client software, go to download.live.com.

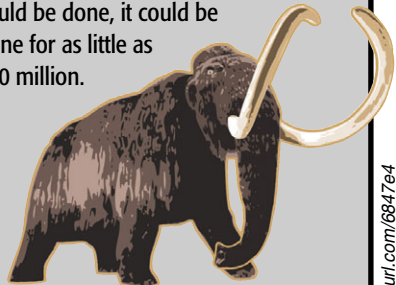
Registry Tip Of The Month

Tired of scrolling down to just the right folder in a sub-key? Regedit actually has a much-overlooked navigation mechanism—typing. From most branches in the directory tree, you can start typing the name of the sub-key you seek, and the cursor will jump down to those letters as you type and refine the selection as you type more letters.

Infinite Loop

Recreating The Mammoth: \$10 Million

Scientists are reporting that they've nearly completed work to fully map the genome of mammoths, the great hairy elephants that went extinct a few thousand years ago. Could scientists bring them back? It's possible, says researcher Dr. Stephan C. Schuster, and if it could be done, it could be done for as little as \$10 million.



tinyurl.com/6847e4



Warm Up To Penguins

Managing Disks With Linux, Part II

Last month, we discussed adding and partitioning a new internal hard drive in Linux, but that's just the tip of the iceberg. Regardless of the operating system you use, you need to be prepared in the event of a hard drive failure. Obviously, if you back up your data regularly, recovering from a lost drive isn't a big deal. And Linux offers you native RAID support for all-important data redundancy.

RAIDs are generally implemented with extra hardware. In most cases, a hardware RAID controller is necessary

for this extra layer of protection, but Linux supports it for free. We wouldn't recommend Linux's software RAID for a heavy-duty file server, but for home use or light server duty, it'll be fine.

For our purposes, we'll be discussing RAID 1 and 5 configurations. As a brief refresher, RAID 1 requires two disks and writes data to both disks simultaneously, protecting your data in the event of a hard drive failure. RAID 5 requires a minimum of three disks and writes data and some recovery information to the disks. If a single drive fails in a RAID 5 array, you can reconstruct the missing data. The main benefit of RAID 1 is there are multiple copies of the same data. The main benefit of RAID 5 is that it strikes a good balance between disk utilization and fault tolerance.

Build A RAID, Linux-Style

Some Linux distributions make it easier to create and manage RAID arrays than others. Typically, those distributions

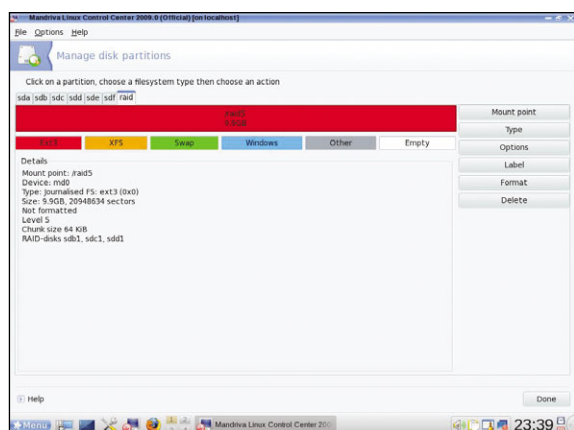
have their own native partitioning programs to make handling arrays easier. If you're using a Linux flavor that uses a third-party partitioning program, you're going to need to be comfortable with the command line.

One example of a distro that uses its own partitioning program is openSUSE, which you can access by opening YaST Control Center and clicking System and Partitioner. You'll receive a warning that using Partitioner is dangerous; click OK to proceed. Next, Partitioner will display a list of all the disks on your system, complete with their partition layouts and filesystems.

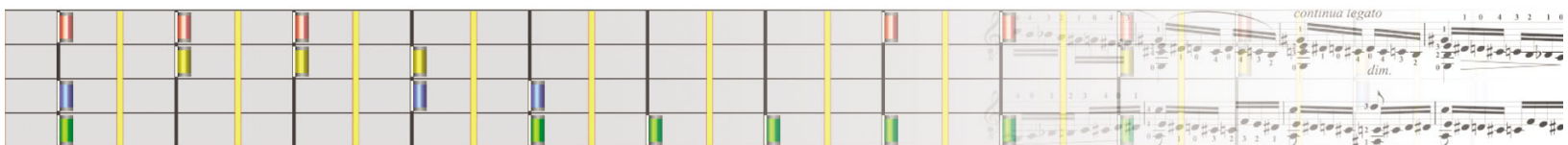
When you're ready to create your RAID array, click the Create button. Select an unused disk that you want to use in your array and then click OK. You'll now be asked to pick the disk to partition, so select Primary Partition and click OK. Instead of selecting the ext3 filesystem as you would normally do, click the Do Not Format radio button, choose 0xFD Linux RAID, and click OK. Repeat this procedure for as many disks as you want in your array.

Once you've created Linux RAID partitions for the disks you want to use in your array, click the RAID button. Select Create RAID, and Partitioner will ask you what type of RAID you want to create. Choose from RAID 0, RAID 1, or RAID 5 and click Next. A list of all unused Linux RAID partitions will appear. Highlight each RAID partition you want to use and click Add. After you're done adding the partitions, click the Next button. Choose the ext3 filesystem, specify its mount point, and click the Finish button.

Back in the Partitioner window, click OK to create your RAID array. A dialog box will show up with a list of tasks Partitioner will do. Click Finish, and after a little bit, you'll have a new directory on your system that's using Linux's software RAID.



Like partitioning software, native or third-party RAID utilities vary from distribution to distribution.



Make A RAID With Mandriva

Mandriva is another popular Linux distribution that includes its own partitioning program. To access it, click Menu, Tools, System Tools, and then Configure Your Computer. On the left, select Local Disks and Manage Disk Partitions on the right. The device name for each disk is shown as tabs across the top. Before you do anything else, click Toggle To Expert Mode in the lower left.

To create your RAID array, click the tab for the first disk you want to use. Then, click the white space underneath it. Click the Create button, which will appear on the right. For Filesystem Type, click the drop-down menu, select Linux RAID, and click OK. Repeat this for as many disks as you want to use in your RAID configuration.

Now that you've prepared the disks you want to use in the array, you're ready to assemble the RAID. Click the tab for each of the disks you've just created a Linux RAID partition for, and then click the gray space under it. Click the Add To RAID button that appears on the right, and a dialog box with the RAID options will appear. Choose the RAID level you want to use and click OK. You'll notice a new tab named Raid. Every time you choose to add a new RAID partition to your array, you can choose an existing array or create a new one. Just keep choosing the array you've created. Do this for each RAID partition you want to add to your array.

After you've added all the partitions, click the Raid tab to access all of the RAID arrays. The tab lets you specify the mount point and filesystem type for each array. You will need to format each array before you can use it on your system. As you format each array, when asked to update the partition table, click OK. When you're done formatting the arrays, click Done. Save the changes in `/etc/fstab`, and you'll be back in Mandriva's Control Center.

If you're not using a Linux distribution that has its own partitioning program,

don't worry. You can still create RAID arrays if you have a terminal window up, and you're logged in as root. Some Linux releases, such as Ubuntu, won't let you log in as root, so you'll have to prefix each of the following commands with `sudo`. Also make sure that the `mdadm` package is installed on your system. The first thing to do is type `fdisk -l` to display a list of your disks and their partitions.

Make note of each disk you want to use and then type `fdisk /dev/sdb`, or whatever is the first disk you're going to use. Then, type `n` to create a new partition and `p` to create a primary partition. For the partition number, type `1` and press ENTER twice to specify the entire disk. Type `t`, which changes the partition type, and `fd` to create a Linux RAID auto partition. Finally, type `w` to save the changes and quit. Repeat this for each disk you want to use in your RAID array.

Once you have created all the RAID partitions you're going to use, you need to actually create the array. To do this, type the following:

```
mdadm --create --verbose /dev/md0
--level=5 --raid-devices=3 /dev/sdb1
/dev/sdc1 /dev/sdd1
```

This will create the array and is accessible through `/dev/md0`. If you want to create multiple arrays, be sure to change `/dev/md0` to something unique each time. The `--level` switch specifies which RAID level to create, while the `--raid-devices` indicates how many disks you're adding. The arguments at the end indicate which RAID partitions to use. In our example, it's `/dev/sdb1`, `/dev/sdc1`, and `/dev/sdd1`, but it may be different on your setup.

What you have now is the raw RAID array. It isn't formatted or accessible, and it won't be available if you reboot. To fix these problems, type in the following commands:

```
mkfs.ext3 /dev/md0
mkdir /raid5
```

```
mount /dev/md0 /raid5
mdadm --verbose --detail --scan >
/etc/mdadm.conf
```

The first command formats your new RAID array to the ext3 filesystem, while the next two commands make it available. The last command saves the new array configuration to be visible the next time you reboot. To make sure your array is always mounted, add in the following line to the end of your `/etc/fstab` file: `/dev/md0 /raid5 ext3 defaults 1 2`.

So while others will spend money to protect their data with hardware-based RAID, Linux gives you peace of mind for free. ▲

by John Jung

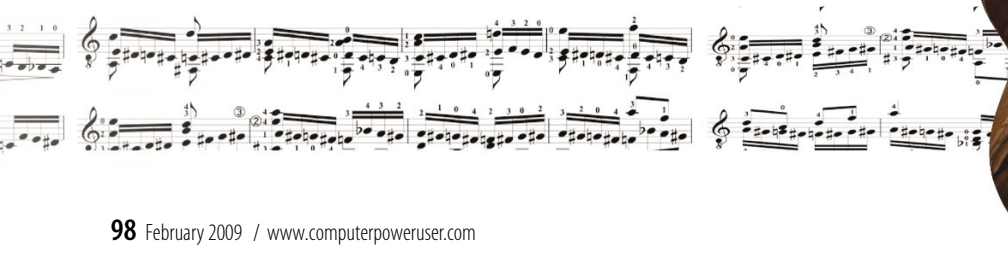
Infinite Loop

Rock Band, Guitar Hero Spark Interest In Real Instruments

Although this borders on information we'd expect in a dispatch from the Obvious Department, a new USC study found that playing the above-mentioned games leads to "dramatic increases in the gamers' interest to own and play real instruments."

Of the players surveyed who don't currently play an instrument, 67% said they will probably pick one up in the next two years (because honestly, it doesn't take very long to memorize "American Woman" on your RB 2 controller).

Source: www.gamedaily.com/games/rock-band-2/playstation-3/game-news/guitar-hero-rock-band-players-showing-increased-interest-in-real-instruments/



Shavings From The Rumour Mill

by Mike Magee

Intel, AMD Speculate On Graphics Futures

You'd be hard-pressed to describe AMD's HQ in Sunnyvale and Intel's HQ in Santa Clara as just a stone's throw apart. (Perhaps a giant could lob a boulder that far.) But they aren't that far away from each other, down in Silicon Valley.

I was privileged enough to visit both Intel and AMD back-to-back over two days recently, and while their HQs may not be that far away from each other in physical terms, these companies' graphics strategies could be described as light years from each other. There is such a clear difference between their approaches on Fusion and on Larrabee, in fact, that we think this really will be the next graphics conflict, likely to affect practically everyone who uses a PC, a mobile phone, or even a netbook in the next few years.

I talked to Raja Koduri, chief technology officer of AMD's graphics group. Koduri was Borged by AMD when it bought ATI, and I wouldn't be surprised if the Fusion concept AMD's pursuing right now was thought through quite deeply when Dave Orton was the CEO of the Canadian firm. In fact, I got the impression that ATI's graphics strategy was one reason why Hector Ruiz and Co. somehow found the money to buy the company.

An unnamed Intel representative explained everything to me differently. He took me round the labs in Santa Clara, and, of course, ray tracing is the name of the game for the chip giant with its Larrabee concept. If you produce 100 x86 multi-core dies, he explained, yields suddenly are not nearly as important as before; you can have between 20 and 30 dies that are just dedicated to graphics, perhaps 10 or 20 that can take care of networking, and one or two that just count stuff and coordinate the whole big cake.

Of course, that implies that Intel has the software to manage all these complicated interactions, and this clearly is a difficult engineering problem. Because of Intel's size, it can just stroll down the highway to Stanford or call its friends up at MIT and get them to joust in its lists. Everyone's happy to talk to Intel.

Strangely, Koduri said that the ATI division of AMD had a far better relationship with Intel after takeover than before it was snapped up. It seems both of them have a common enemy called Nvidia. But even my unnamed Intel source agreed that AMD's Fusion idea has legs and could well give Larrabee a run. It is all down to latency—or, as we old-fashioned folk call it, lateness. Will AMD's coprocessor approach with Fusion deliver speedy results faster than Intel's multicore answer?

I believe, after talking to both firms, that each is watching the other most carefully. Naturally, the engineers at the far better-funded Intel have considered AMD's approach in the past, as well. But when a chip company commits to a course of action, it is looking two or three years ahead of a project becoming reality.

Neither Intel nor AMD suggested this, but it could be that, in the end, the semiconductor challenges of the future mean a degree of cooperation that we've never seen before in the chip industry. Both firms need to make products and sell them, and they face challenges from outside the x86 realm. Jerry Sanders III, the founder of AMD, has a bust in the lobby of the AMD HQ in Sunnyvale. He once, rather blasphemously, described AMD, Intel, and Microsoft as the Holy Trinity. He meant, of course, that the three controlled the industry.

But I rather think that both AMD and Intel are painting Microsoft into a corner, and neither will be dictated to buy the software giant in the future. Few hardware details have yet emerged about Microsoft's upcoming Windows 7, but neither of the architectures that AMD and Intel are working to bring to market will depend on DirectX. As a result, Microsoft will need to develop compelling parallelised software in support of Intel *and* must take account of AMD-ATI coprocessing units that push their operating system to its limits. The worm has turned. ▲



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

Send rumours to "Mad Mike" Magee at mike@cpumag.com

Wagging The Dog

by Rahul Sood

The Gaming PC As We Know It Is Doomed

In this run-down economy it's clear that companies need to carefully adjust the way they do business in order to succeed in the long term. The trick is adjusting to challenging times without over-reacting. Being too reactionary is always bad, but common sense dictates that companies consider the current market conditions and adapt accordingly.

Few could have predicted the economic devastation that we're currently seeing; stocks are down to incredible lows and many companies are slashing their forecasts based on current demand. We're seeing companies like AMD and Ford hanging on by a thread; Apple lost 50% of its value; and the incredibly profitable Intel has seen its market cap decimated. Of course, companies like Apple and Intel are fundamentally sound and will be fine in the long run. Others, like Nvidia and AMD, are facing some incredible challenges, and although they may pull through, their product roadmaps will likely change dramatically, which brings me to my point: The gaming PC as we know it is doomed.

I am not saying PC gaming is doomed, because it's not—far from it—but the PC with four GPUs, a 2-kilowatt power supply, 16 gigabytes of memory, and a stack of hard drives is all but distant memory, at least for the PC gamer.

Sure, there was a time when a gamer would slap down his credit card and buy a maxed-out configuration just to eke out a few more frames per second, but as the hardware reached its potential and new consoles were released, the landscape started to change. We witnessed this change some time ago (I've been writing about it here and there), and I have publicly called on AMD and Nvidia to bring more value to their offerings, because quite frankly I cannot justify buying three \$500 video cards just to play a game.

And hey, if I can't justify it, how are we supposed to sell it to our customers? There was a time when selling high-end hardware was easy, because we believed in it. Now we're retooling and retasking our configurations so they make sense; let's face it, high-end hardware has delivered diminishing returns in

terms of value. This is why you don't see ridiculous offerings like Quad SLI and 2-kilowatt power supplies coming from our company.

Ever since the Crysis fiasco, things have changed dramatically. We're seeing a push for HDMI-enabled 1,900 x 1,200 displays, and manufacturers are stacking them with such extras as Web cams, audio, and microphones and selling them for less than a high-end graphics card. Even the 4-megapixel displays (30-inch diagonal

screens with 2,560 x 1,600 resolution) are still popular, but you don't need a Cray supercomputer to run them.

We're also seeing Intel bringing low-power, high-efficiency CPUs to the desktop. In the meantime, both AMD and Nvidia are trying to pull down their thermal specs, though you'd never guess based on the current requirements. It would take some prodding to get them to see the light—and we're almost there. Nvidia has some amazing stuff in the works, including Hybrid SLI and, of course, Visual Computing, which will change the company's value statement dramatically.

Here's the bottom line: The glory days of wicked-stupid hardware requirements are pretty much gone. Game developers are in the business of making money, and thus want to distribute their games to the widest possible audience.

This doesn't mean current games don't scale, because we all know that games on the PC scale well if designed properly. You can buy a game that delivers a half-decent experience on a mainstream computer and a killer experience on a higher-end PC. The question is, just how high-end does one need to go in terms of hardware before he blows his brains out?

Yes, some cataclysmic changes are coming in this industry. For those of you wondering what will happen to the boutique space, I would suggest that unless the boutiques see the light, there won't be much of a space left. It's a serious challenge, and it requires serious resources to keep up with the innovation that's about to unfold. ▲



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple IIc and painted it red before turning it on. His parents' dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

Send your opinions to this opinionated guy at rahul@cpumag.com

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Technically Speaking

Interview With Sascha Meinrath,
Research Director, New American
Foundation Wireless Future Program

Sascha Meinrath is the research director of the New America Foundation's Wireless Future Program and coordinates the Foundation's Open Technology Initiative. He is an expert on municipal broadband, community wireless networks, and telecommunications policy. He blogs regularly at www.saschameinrath.com.

by Barry Brenesal



CPU: This month, it'll have been legally mandated that all high-power television broadcasts in the United States will be digital, between 54 and 698MHz. Because TV stations have "guard bands" separating broadcast frequencies, there are so-called "white spaces" between many channels. They've fueled a furious debate over who will control all this prime broadcast real estate. In early November 2008, the FCC finally ruled in favor of those who wanted unlicensed public access.

Meanwhile, referring to the furious debate that was waged for years over this issue, a former chief engineer of the FCC, Ed Thomas, described it as "basically a lobbying food fight." Do you consider that a fair description?

Meinrath: Certainly on one side, you have lobbyists for the National Association of Broadcasters, and on the other side, for Microsoft and Google. But you also have a lot of community organizers, advocates, public interest groups, consumer rights groups, and WISPs (wireless Internet service providers) fighting beside high-tech industry. So while a lobbying food fight places things in its simplest terms, there's a

much larger coalition on the side fighting for white space devices. It's also the case that if it was just two groups of competing lobbyists on this issue, we probably would not have had the successes that we did.

CPU: How do you mean?

Meinrath: Certain FCC commissioners—Adelstein, Copps, and Martin, in particular—were very clear that what really pushed them to make their final decision was not just these high-tech firms that wanted to build and market devices but all the public advocacy groups that were on the same side in this battle. That really affected the political math.

CPU: Yet in March 2008, Verizon, AT&T, and a half dozen other mobile telecoms spent \$19.6 billion in an FCC auction of a limited portion of former TV channels. You're making the FCC ruling sound a bit like a "Mr. Smith Goes to Washington" scenario, where the big money is pushed aside by the little guy.

Meinrath: In this case, the FCC certainly set a precedent for doing exactly

that. It is admittedly a radical departure from 80 years of spectrum licensure—this notion of a command-and-control infrastructure, where specific bands are licensed to a single entity to broadcast. That's why when Verizon spent over \$4.6 billion on the C Block of 700MHz; what it was paying for was this exclusivity of use.

Yet one of the sad realities is that this exclusive licensure has been incredibly inefficient in terms of spectrum usage. At any given point in time and locale, more than 90% of the available spectrum is being unused, according to the group Shared Spectrum that did research on real world usage under an NSF grant—even though, when you look at the allocation chart, it appears as though the spectrum is full. That really shifts the entire concept of what it means to have spectrum access and usage. Especially since technology over the past 10 to 15 years has made it possible for us to find unutilized spectrum on the fly.

CPU: Yet Sprint Nextel, the NAB, and T-Mobile USA have all argued that the problem isn't white spaces themselves but

the unlicensed use of these products in white spaces, and that spectrum use should be auctioned with a traditional licensing plan to the highest bidder. What's wrong in your opinion with this idea?

Meinrath: There are certain fundamental problems in terms of First Amendment issues, the elimination of diversity, lack of general access to the airwaves, and an incredible amount of conglomeratization we've seen among organizations that do have that access.

But even when we just assume that licensure is the way we want to go, this notion that a single buyer who pays the most is equivalent to maximizing the public good is fundamentally flawed. This is what John Forbes Nash won a Nobel Prize in Economics for explaining: the single highest use by a single entity may not be the most beneficial use. Spectrum is certainly a suitable example because of the network effects

different networks, frequencies, and systems, on the fly, in real time, based on what you want to do.

You can imagine the next generation Google phone 3.0 that allows you to use Bluetooth and wireless and ultra-wide-band and white space and WiMAX and T-Mobile and AT&T. Depending on whether you want to move a file to your friend 50 feet away, it might choose a high frequency with a lot of throughput but not a lot of distance; but if your friend is five miles away, it might select a low frequency and connect directly to them. If you need to have high quality of service, it might choose a cellular provider, so you've got a crystal clear line, but if you really don't care, it might swap to Wi-Fi and go out via Skype. All of these choices become transparent to, and empower, end users.

CPU: Presumably the FCC deregulation of white spaces wasn't intended to leave

being active in the same area, on the same frequencies?

Meinrath: The one that your readers will probably be most familiar with is Wi-Fi, in the 2.4GHz band. The 2.4GHz band allows for laptops, garage door openers, baby monitors, microwave ovens, etc., all sharing a single frequency. They coexist because there are parameters for their use. After all, you don't want microwave ovens leaking high-powered radiation into the surrounding environment, and you don't want your laptop wireless card to start frying eggs on your countertop because it's transmitting at too high of a power level.

CPU: So the argument made to the FCC, back in October of 2007, from four of the largest television networks claiming that allowing low-power Wi-Fi to operate on the same frequencies as television channels would cause "permanent damage

It was specious at best and just short of an outright lie—carefully crafted to give a sense of danger.

—Sascha Meinrath

where the more people have access to it, the more benefits accrue to everyone. This has really not been taken into account in the way we allocate and license our broadcast spectrum.

CPU: What did the mobile telecoms and the others who have been opposing public white space allocation stand to gain if they had restricted access, as they hoped?

Meinrath: If you can create artificial scarcity, then you can commoditize that scarcity. Their reluctance to evolve a business model to take advantage of more peer-to-peer applications, services, and functionality: That's really what's caused the friction over this issue. On the other hand, there's a huge amount to gain by creating networks that untether their users. The next logical step is to create devices, which can switch between any one of a number of

things wide open, was it? They must have set strictly predetermined ground rules to control the chaos.

Meinrath: Exactly. We have numerous precursors of this—everything from the iTrip for your iPod (which broadcasts on an FM frequency), to all of the unlicensed wireless microphones (which often broadcast on the exact same frequencies as television stations without causing harmful interference). What's important is setting parameters under which these unlicensed devices operate. As technologies become smarter, as their capacities become greater, there's no reason one can't set conditions for use inside the hardware. This allows a multitude of different devices and technologies to coexist in unlicensed spaces.

CPU: Can you give us an example of a multitude of spectrum-using devices all

to over-the-air digital television reception" was inaccurate?

Meinrath: It was specious at best and just short of an outright lie—carefully crafted to give a sense of danger. If you were to roll out the playbook that has been used by the NAB and others, you'd find they made the exact same arguments in the past against low-power FM radio stations, cellphones, smartphones, the VCR, cable television—repeatedly, each step of the way, every time a new, innovative technology might disrupt the antiquated business model that they've set up.

CPU: You've been quoted in "Wired" as saying "This will lower the cost of communications by facilitating new technology. Software and devices is an enormous win for public interest." What sort of timeline are we looking at before that

lower cost of communications you mentioned appears?

Meinrath: In an optimal situation, we would be looking at late 2009 or early 2010 for the first devices to be hitting the market in your Best Buy types of stores. But this is partially dependent upon what NAB and company do next. They're already pushing back—going to Congress to overturn the FCC ruling. We know they'll file petitions to reconsider at the FCC, and they're probably going to take this matter to the courts, as well. So we might be looking at 2011 before the first devices are available. I would also suspect that we will begin to see new services and applications very soon after that; perhaps even concurrent with the release of these new technologies.

CPU: I think you'd agree that it's an odd decision to be made by this particular FCC, since under FCC Chairman Kevin J. Martin, it's not been known for an interest in media diversity or public advocacy. What do you think accounts not only for this decision, but the fact that they did it at

Copps and Adelstein have been saying for years. Had one of those two been in charge, I think it would have been addressed far faster than it was, but as soon as they created the trio needed to vote for this, both Commissioners Tate and McDowell joined in.

CPU: Chairmain Martin stated that there are provisions in the rules meant to protect TV broadcasters and microphones, and that any device offered by a tech company for white space application would go through a "rigorous certification process." What processes are you aware of that are being implemented or considered for implementation that would qualify?

Meinrath: Let me take a quick moment and explain what the approval process for white space devices has been. The first phase was always going to be feasibility testing. The FCC's Office of Engineering and Technology had several goals: are these devices viable? How do they work? How can we break them, and under what circumstances?

Meinrath: The next logical progression is to look at not just television white spaces, but white spaces everywhere. Because if you look at spectrum usage today, we're only using a tiny fraction of what's available. I think that the research on this has been perfectly clear—the technologies are available for us to make far better use of the public airwaves than we have thus far.

CPU: Are we talking here about mesh networks, auxiliary public safety communications, rural broadband deployment...?

Meinrath: As it happens, I just wrote an article for Government Technology on the public safety band. I interviewed CEOs in San Francisco and Harris County in Houston, in Boston and New York City, talking to them about their infrastructure needs. They, too, are feeling as though we don't have access to the resources we need for emergency response.

In the wireless realm, we've thrown out everything we've learned about what

In the wireless realm, we've thrown out everything we've learned about what works on the Internet.

—Sascha Meinrath

the tail end of their existence, with a 5-0 lopsided vote, before a new administration could appoint its own commissioners?

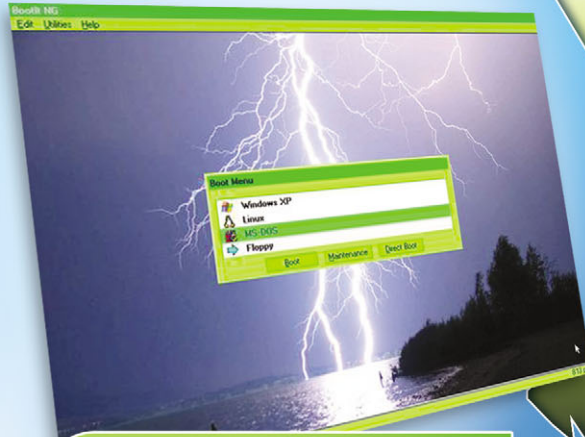
Meinrath: The reason was that as the United States continued to stagnate in terms of its broadband penetration rates, it became very clear that something needed to be done to shake up the current system. While I've been on the other side of the table from Chairman Martin on a variety of issues, I think he also saw the importance of facilitating new technologies and innovative business models by spreading connectivity and broadband access in particular. He has a fairly coherent agenda, and in this case it happens to align very well with what Commissioners

The second phase was to create the technical specifications for these devices. Having determined that they were viable, what power levels do we want them to have? What sort of usage? Unlicensed, licensed, light licensed: all of it would be laid out in the specifications. Only once that was finished, do you then proceed to the certification phase, which is where you take a device manufactured to specific technical specifications and run it through a battery of tests before it gets official approval to be sold to consumers. After a device goes through those three phases, it finally ends up on a store shelf.

CPU: Is this the end of the story for white spaces?

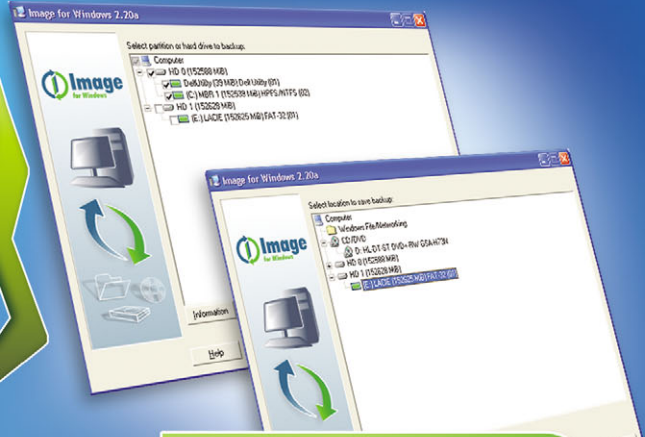
works on the Internet. The Internet is open protocol, open architecture, open source, interoperable; and in the wireless realm, everything is closed, proprietary, doesn't interoperate, possesses its own "secure" protocols that don't work with other systems. The wireless realm is all about vendor lock-in and path dependencies—and that's a horrible way to build a next generation telecommunications infrastructure. My hope is that people will realize their cell phones should be able to communicate with those of their friends down the hall, without having to pay a toll to place a call 50 feet away. Why can't we communicate directly? This is the kind of direct consumer benefit that white spaces make possible. **CPU**

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Under Development

A Peek At What's Brewing In The Laboratory

Lumisonic Sheds Light On Sound For The Deaf

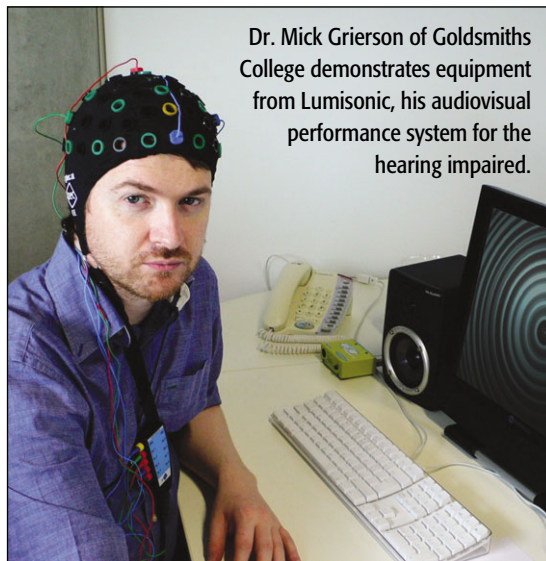
Take a dash of experimental film tradition, two pinches of neuroscientific research, a cup of pure arts research, mix with a large batch of creative mad musician, and let rise. In time, you'll be able to serve up a healthy portion of Lumisonic, an audiovisual performance system for children with hearing disabilities and autism.

Dr. Mick Grierson, developer and resident mad musician at Goldsmiths College, University of London, has found that interaction with a graphical representation of sound patterns lets hearing-impaired kids have a new relationship with sound and thus produce music themselves. They can also understand the quality of sound (loud, soft, long, short, etc.) they are speaking.

"Lumisonic works by converting sound information into an animated, moving image consisting of radiating concentric circles," Grierson says. "It's similar in many ways to a graphic equalizer, providing information about the type of sound, not just its volume."

"Importantly, it's a much finer resolution than a graphic equalizer, and it's designed to communicate information far more quickly by taking advantage of visual structures related to depth perception."

At the moment, Lumisonic has four basic applications. It delivers visual feedback of a sound in real time, which is helpful in speech therapy and understanding harmonics. In addition to manipulating prerecorded sounds to create new ones, users can manipulate real-time sounds. Finally, Lumisonic can record and play back sounds.



Dr. Mick Grierson of Goldsmiths College demonstrates equipment from Lumisonic, his audiovisual performance system for the hearing impaired.

Development (with input from the Sonic Arts Network, Whitefield Schools and Centre, and the London Philharmonic Orchestra) was relatively simple, says Grierson. "The project has some custom code written in C, but was otherwise developed in Max/MSP/Jitter. As a result, it runs on most current Windows and Macintosh computers. We're also working on a version for mobile devices, including the iPhone." Grierson offers version 1 of Lumisonic as a free download so parents and teachers can utilize it. Lumisonic is already utilized in special-needs schools to aid in music and speech therapy.

As for future development, Grierson is building on the first version to create "a new version specifically for speech therapy," which he hopes to release this spring. For now, Grierson is extremely encouraged by the feedback he's received from the deaf community.

"Seeing the impact Lumisonic has already had on people has been genuinely moving," he says. "That's the best feeling in the world—discovering that something you're doing can actually help people." ▲

"Virtuality" Gets A Much-Needed IMPROVEment

Remember the "cutting edge" virtual reality videogames at arcades back in the day, complete with huge screen, chunky helmet, and gloves? Remember your crashing disappointment when you finally experienced both the disorienting view and cheesy graphics of these early attempts at VR? Soon the novelty wore off, and VR (gaming, at least) lost its allure.

But the technology didn't disappear altogether. A European consortium led by the Fraunhofer Institute, dubbed "IMPROVE," has assessed the drawbacks of virtual reality and has made dramatic improvements to the technology.

For example, IMPROVE has focused on improving the basic shortcomings of VR displays. Whether head-mounted, handheld, or large-tiled, display images have been typically unrealistic, washed-out, rendered poorly because of color calibration problems, or unrealistically tracked when mixed with real-life backgrounds. IMPROVE has already produced three prototypes in an attempt to correct these problems. Two are HMDs (head-mounted displays), using OLED and LCoS microdisplays, respectively, and a third is a pair of handheld, stereoscopic binoculars. All of the displays let users view virtual high-resolution images on real backgrounds.

The team's software improves both rendering and video streaming of high-quality, 3D stereoscopic images across wireless networks, utilizing a desktop system for remote rendering work. Compressed signals stream to a wireless unit and are then projected to a real backdrop. Other IMPROVE software corrects color variation in big, multi-tiled projections. In addition, users can collaborate and interact with these systems alone or in teams, plus note changes in real time via voice, gestures, menus, or with a Wacom-style tablet. ▲

Virtual World Works To Heal Healthcare Woes



University of Arkansas' "Razorback Hospital" was built in Second Life to test the future of pervasive computing in health care.

The latest tour around University of Arkansas' "Razorback Hospital" may be the cheapest, most high-tech visit you've ever experienced. You'll witness efficiencies in health care you've only dreamed of previously. Of course, you'll need a Second Life avatar to enter, but once there, you'll witness an experiment in modeling efficient healthcare logistics (think

supply-chain networks, database and inventory management, and patient-information systems) that assume a futuristic, but soon-attainable, world.

Professors Craig Thompson and Fran Hagstrom, along with a group of 40 university and six high school students, developed Razorback Hospital and dealt with challenges that were also opportunities "to use virtual

worlds to think about the future of pervasive computing," says Thompson. "We can try experiments in a virtual world much cheaper and quicker than we can by inventing the technology in the real world."

Thompson's team created a soup-to-nuts virtual hospital, leaving out no details. Then, using ubiquitous virtual RFID tags and sensors, all scripted items were networked so any one item could "communicate" with any other. In this way, every object is "smart." Pill bottles can only be opened by their owner and will only dispense the right prescription; pallets of equipment are automatically inventoried; and no one can steal supplies on their way out of the hospital.

Thompson hopes that his team's work will help create a

new paradigm for health care delivery. Razorback Hospital is a great opportunity for training hospital personnel and testing smart objects' interaction, such as "an IV drip and a heart monitor [communicating] to keep the IV drip supplying just the right amount of medication for a patient in surgery."

In addition, Thompson asserts that "mirror worlds," where a virtual world accurately mimics a real world counterpart, will be common in 10 years. Thus, "similar technology could be used at home to monitor patients or to connect outpatients to their physicians, or the elderly to friends and family, reducing isolation and increasing independence."

Ultimately, the goal is to translate these virtual systems to real-world health care situations. ▲

Industry & Academia Partner To Make Genome "One-Chip"

Although it's a relatively new science, genome research has already established a relationship with the chip industry. Just five years ago, the first DNA microarray (or chip) was utilized to probe and identify thousands of changes in a human genome. Two years ago, a partnership between the Broad Institute at MIT, Harvard, and Affymetrix birthed the Affymetrix GeneChip Human Mapping 500K Array Set. This pair of chips analyzed 500,000 single-letter variations in DNA sequences. Despite this leap, Broad Institute scientist Steven McCarroll needed more from the chips for his genome research.

"To understand how genetic factors influence disease risk, it is important for

researchers to be able to measure multiple types of human genetic variation," says McCarroll. These include single nucleotide polymorphisms or SNPs (single letter changes to the genetic code) and CNVs (copy-number variants—large chunks of DNA that can be missing altogether or present in excess copies)."

Yet the 500K SNP chips only indirectly measured CNVs, so McCarroll joined with colleague Finny Kuruvilla and Harvard's Joshua Korn to design a "one-chip" array, which could then probe for both SNPs and CNVs in one experiment. They then handed off the design to industry cohort Affymetrix, which led to successful devel-



MIT's Broad Institute, Harvard, and Affymetrix partnered to develop an advanced chip to help study genetic variations in the role of disease.

opment of the Genome-Wide Human SNP Array 6.0. This has allowed studies of both variations and their possible contributions to diseases such as autism and schizophrenia, says McCarroll.

One bump in the development process was the lack of computer algorithms available to process the chip's dual

capabilities. Korn was part of the research team that developed the fix, called "Birdsuite," which took into account the "important duality to joining studies of SNPs and copy-number while also distinguishing the common variants from the rare ones."

As for future development, McCarroll says, "We think it's important that the content of array platforms expand to interrogate an ever-larger set of genetic polymorphisms in disease studies. We are working together with a broad group of academic investigators to generate more complete catalogs of genetic variants—common and rare, SNP and CNV—that any company can include in future generations." ▲

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Tech Service Club LAN Party - Annandale, NJ
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Q&A With Boyd Multerer

Microsoft has been trying to make game development simpler and less expensive for some time. As it launched the Xbox 360 hardware, it developed a parallel effort to create a set of game development tools that made it easy to create Xbox 360 titles and PC games at the same time. The tools have been out for a while, and Microsoft also launched a \$99 version of them, dubbed XNA Game Studio Express. That low price is meant to invite anyone at universities and fledgling game development studios to create new games. And now Microsoft is preparing to launch the Xbox Live Community Games Channel, where game creators can upload their games and gamers can purchase them. Boyd Multerer is the general manager for the XNA platform at Microsoft. He has been working on XNA for a number of years.

Q How did you get started with the XNA Community Games project?

BM We started the XNA project about four years ago. It came to be known as the XNA Game Studio Express. J Allard led it. I was involved. So was Chris Satchell. When J gave the keynote speech at the Game Developers Conference, people expected him to talk about the Xbox 360. Instead of talking about the Xbox 360, which was still secret at the time, he gave a slightly different message. It was about how much more difficult it was becoming to write video games, especially as you move to high-definition animation. The amount of detailed 3-D rendered art is enormous. It takes an army of artists. And you move to the modern machines. The amount of cost and the amount of risk you take escalated dramatically. If you're not building a blockbuster, it's very difficult to get a lot of money to build a game right now.

The video game industry of today pretty much looked like the movie industry in the 1980s. In that time, you only had blockbuster movies. You had "Star Wars," and

that led to all sorts of blockbuster action movies. It was a huge amount of risk. But at the end of the 1980s, "Sex, Lies, and Videotape" came out. The indie scene materialized for movies. They were low budget, high quality. It didn't kill the blockbusters. As a result, there is a lot more choice when you go to the movies now. We are poised at the same space in the video game industry. What we have been doing with XNA Game Studio is to build a tool-set that will help lower the costs of building games. We made it available to small shops and everybody who wants to make games. On Nov. 19 [2008], as part of the new Xbox experience, we are making available the community games that are the fruits of that work.

Q Tell me about the price you're charging. This is a first for the console industry in a lot of ways.

BM The developer picks the price. It can be 200, 400, or 800 points. That's \$2.50, \$5, or \$10. They keep 70%.

Q Does Microsoft's percentage cover the cost of the tools?

BM We spent money developing the whole system. We developed the tools. We're a public company and we'll try to make a little profit on it, too.

Q There is no limit to how many games you can have on this.

BM That's right.

Q What makes the good games rise to the top? How will people find the best games, particularly since you're going to have huge numbers here?

BM When you enter the community section of Xbox Live



experience, we can highlight a certain number of games at the very front. That's like putting a table of the most popular books at the front of the bookstore.

Q Can there be such a thing as too many games on a console?

BM As more and more games come, we will have to innovate what you can do with searching and filtering mechanisms. That's why using the Xbox Web site to mirror what we have on the console will be very important. You can do more sophisticated searching on the Web site. Highlighting things at that front table in the bookstore becomes really important. In the beginning, there won't be that many games. But it will be a good problem to have when there are too many games in the future.

Q So the next "Gears of War" is coming from the community games channel?

BM We'll see. ▲

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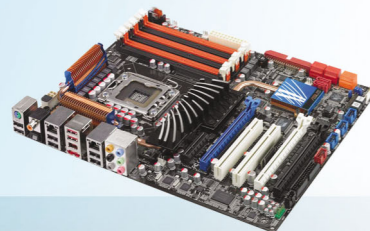
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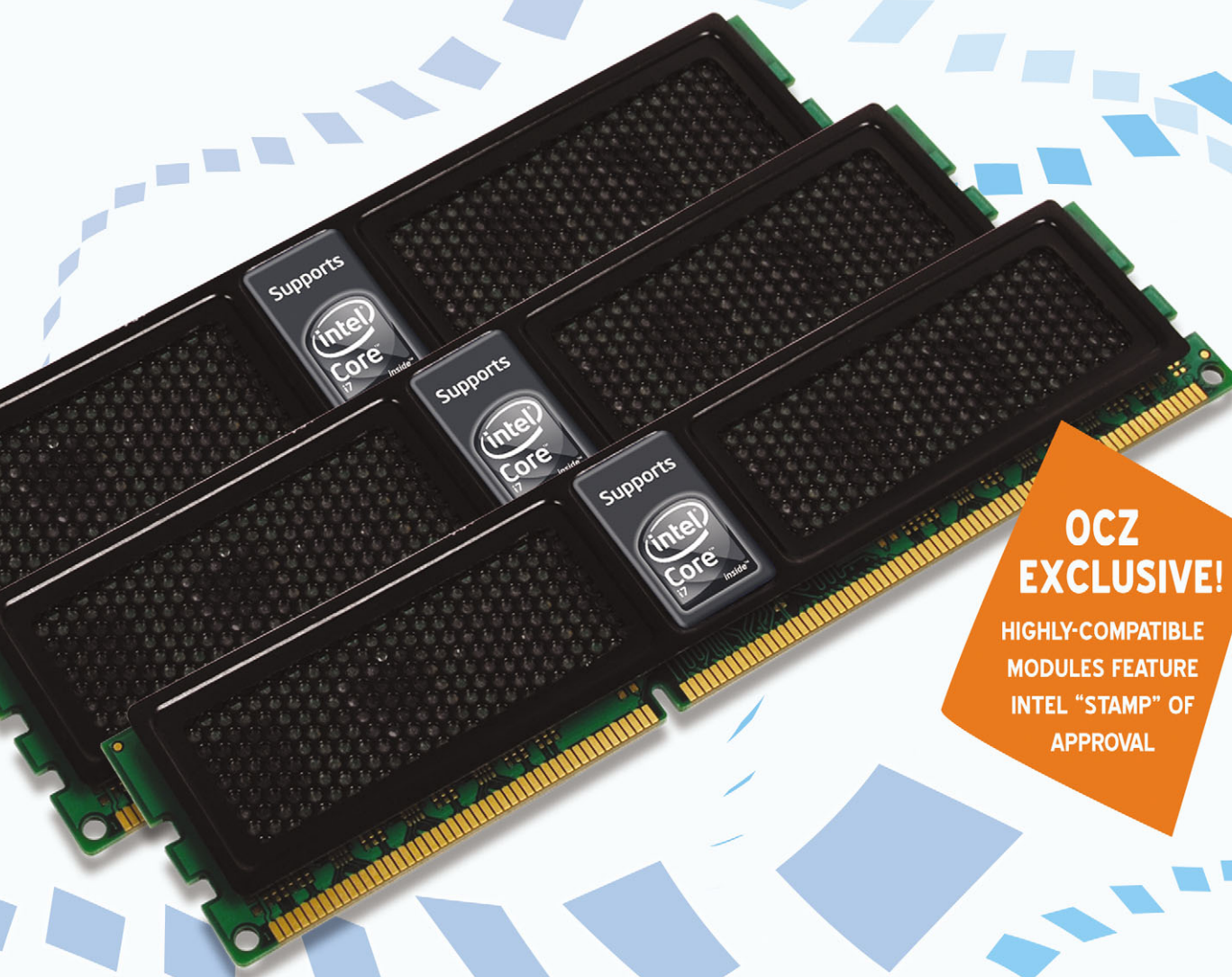
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